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Handbook on Galvanized IRON

for

CORNICES
MARQUISES
SKYLIGHTS

Prepared by

ARMCO ARCHITECTURAL
CONSULTING SERVICE
Middletown, Ohio

A. I. A. File No. 12 j-1

Presented to

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HANDBOOK ON

GALVANIZED IRON

for

CORNICES, MARQUISES and SKYLIGHTS

Practical construction and erection details of various types of cornices, marquises and skylights, with suggested specifications, and a special section on the economy of using rust-resisting pure iron.

Edited in Collaboration with Architectural and Sheet Metal Contracting Firms

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Foreword

TO give architects practical information on the construction and erection of galvanized iron cornices, marquises, and skylights, that they may specify and detail such methods and properly superintend the carrying out of these specifications, is the purpose of this book.

In compiling this manual we have attempted to include examples of most commonly used types of cornices, marquises, and skylights.

No particular effort was made at design though, of course, design often determines the methods of construction. Nevertheless, we are confident that methods given in this manual are applicable to the great majority of construction problems peculiar to these building parts.

Although the methods shown are *not the only good methods* for the respective problems, *they are thoroughly practical* and can be depended upon to give a first class and entirely satisfactory job. Every type of building part, and every method shown, has proved its practicability in actual use.

In order to show a variety of accepted good methods of performing various operations, different methods are shown on each drawing, when possible.

Also, to simplify the drawings, a feature is explained and detailed in only the first example requiring that feature. Each succeeding drawing and the accompanying explanation are designed to emphasize new features which the example embraces.

Acknowledgment

WE acknowledge, with thanks, the assistance of The American Institute of Architects in criticising the subject matter and form of presentation of this publication.

Also, we thank Architects Edward H. Kruckemeyer and Charles R. Strong, Cincinnati, and Harry G. Fahnle of the sheet metal firm of Breese Brothers Company, Cincinnati, for their cooperation in preparing the drawings and compiling and editing this book.

And to W. C. Markle, Secretary, The National Association of Sheet Metal Contractors; Edwin A. Scott, President, Edwin A. Scott Publishing Company, and Editor of Sheet Metal Worker; and the many Ingot Iron Shops who so generously gave their time and thought, we are greatly indebted.

ARMCO ARCHITECTURAL CONSULTING SERVICE

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Some of the Recognized Advantages of Galvanized Pure Iron

PROPERLY applied, under normal service conditions, and with reasonable care, galvanized iron of proper weight will last the profitable life of a structure.

As a material for cornices, marquises, skylights, and other severe forming requirements, galvanized iron has these distinct advantages:

LIGHT WEIGHT: Any reasonable projection is possible, with lighter supporting structures throughout the building. Galvanized iron makes possible low erection and anchoring costs; provides maximum degree of safety under normal conditions, fires, earthquakes, and explosions.

It also eliminates damage to supporting members—buckling, sagging, and warping.

EXPEDITES PROGRESS: Because of its light weight and resulting light supporting structure, galvanized iron work dovetails readily with other trades, thus minimizing lost time through delays.

ECONOMY: Besides its low material cost, galvanized iron makes possible a decided saving in forming and maintenance, compared with heavier forms of construction.

EASE OF REPRODUCING ALL CREATIONS: There is practically no limit to the forming possibilities of galvanized iron. Designs can be executed quickly. Lines are clean cut and permanently formed.

CHANGES OR ALTERATIONS: The comparative ease and economy of altering sheet metal construction when remodeling, may easily be seen.

APPEARANCE: The most intricate details of design can be faithfully followed. Besides unlimited possibilities in design, the attractive appearance of galvanized iron can be maintained with greater ease and at lower cost, by cleansing or re-painting in any color or shade of color desired.

RETAINS GENERAL FORM AND POSITION: Contour and alignment of galvanized iron cornices can be preserved with less attention to backing and supporting members.

LESS EXPANSION AND CONTRACTION: Iron has the lowest coefficient of expansion of all sheet metals used for construction purposes. Therefore, iron has a decided advantage to start with, from the standpoint of securing proper construction. See "Expansion and Contraction," page 9.

PREVENTS DISCOLORATION AT JOINTS: When galvanized iron is properly applied, the discoloration so common with other forms of cornice construction, can be avoided. Efflorescence and unsightly chipping and breaking are also avoided.

LIGHTNING-PROOF AND FIRE-PROOF: When properly grounded, galvanized iron is immune to damage by lightning, as well as being fireproof.

Considering these many advantages, where is there a better material than galvanized iron for cornices, marquises, skylights, and other kinds of architectural sheet metal work? But the degree of benefit from these many advantages is largely dependent upon the quality and weight of galvanized iron used.

When comparing the slight difference in material cost with the cost of the finished job, the wisdom of specifying good quality, and heavy gauge galvanized iron, is certainly unquestionable.

General Information Pertaining to Galvanized Iron for Architectural Sheet Metal Work

GAUGE TO USE: The following gauges of galvanized ARMCO Ingot Iron for various kinds of architectural sheet metal work are recommended. The heavier gauges (smaller numbers) are recommended for use where corrosive conditions are severe—industrial localities, near railroads, along seacoasts, etc.

Building Part	Recommended Gauge to Use
Cornices	*24-26
Marquises	*24-26
Skylights	22-26

*Note: A heavier gauge of galvanized iron than used for rest of cornice or marquise (preferably 22 gauge) is recommended for cornice deck and marquise roof covers because of slight pitch, frequent subjection to rainfall, snow, ice, and tendency of refuse to collect on this surface.

STANDARD GAUGES AND SIZES: Galvanized Iron (ARMCO Ingot Iron) sheets are available from stock in even gauges—18 to 28 inclusive—24″, 28″, and 30″ wide; 96″ and 120″ long, and 26″ x 96″. In addition, 26″ x 120″ standard sheets are available in 24 to 28 gauge inclusive. Gauges 14 and 16 are available in 30″ and 36″ wide, 96″ and 120″ long, and 28″ x 120″. Sixteen gauge is also available in 24″ x 96″ sheets.

COATING: ARMCO Ingot Iron sheets are galvanized (coated with zinc) to the average weight for the specified gauge, shown in the table below:

Standard Weight of Coating For Galvanized ARMCO Ingot Iron Sheets

Galvanized Sheet Gauge No.	Average Weight of Coating Oz. Per Sq. Ft.
10	1.75
12	1.75
14	1.75
16	1.50
18	1.50
20	1.50
22	1.50
24	1.50
26	1.40
28	1.40

The mills try to put the heaviest galvanized coating on sheet iron that will withstand severe forming and seaming operations, as this zinc coating gives added protection to the base metal.

Care should be taken by the sheet metal contractor not to break or mar this coating, when handling and forming the sheets. Hammering on the sheets should be done with a wood mallet.

EXPANSION AND CONTRACTION: Sheet metal parts for which proper allowance for this factor has not been made, in many instances develop ruptures outside the seams.

As may readily be seen below, iron offers a decided advantage by its minimum reaction to fluctuating temperatures. What variation does occur can be readily taken up entirely with expansion joints that leave the sheet iron flat and true of surface at all times, at the same time causing no injurious strain to the metal.

The following table gives the coefficients of linear expansion per degree Fahrenheit, of those sheet metals commonly used for construction purposes. The whole numbers and fractions at right are given to more readily show the difference:

Iron (Ingot Iron)	.00000717	1.
*Copper	.00000928	1.3
*Zinc	.00001620	2.2
*Lead	.00001624	2.3

*Marks Mechanical Engineers' Handbook—1924.

Best available figures, and these only approximate, give for United States conditions, 200 deg. Fahrenheit difference between the coldest cold night temperature and the hottest hot day sunlight surface temperature. Note that the temperature of sheet metal exposed to the sun is much higher than the surrounding air.

The following table gives the total contraction of sheets of the length given if laid in the hottest weather, based on the above temperature.

	Length Between Expansion Joints		
	2 ft.	20 ft.	100 ft.
Total contraction for Iron	.034″	.34″	1.7″
Total contraction for Copper	.044″	.44″	2.2″
Total contraction for Zinc	.078″	.78″	3.9″
Total contraction for Lead	.078″	.78″	3.9″

Necessary provision for expansion and contraction with galvanized iron is included in the construction details of this manual.

OTHER MATERIALS IN CONTACT: To guard against unnecessary corrosion, materials that are electro-negative to zinc and iron should not be placed in direct contact with galvanized iron. Most common among materials of this kind used for general construction work, are copper and brass. Thus electrolysis will be avoided.

For further information on the subject of electrolysis, as related to corrosion, see page 51, "The Development and Service of ARMCO Ingot Iron."

PAINTING GALVANIZED IRON: Oil or grease, finger marks, etc., should be removed by washing with gasoline before any painting is done.

Because of the smooth, sparkling surface of galvanized iron, paint is apt to peel unless the sheet is sufficiently weathered, either by natural exposure, or by artificial means.

Natural weathering is recommended wherever possible for the benefit of the added protection from the zinc coating, during the course of weathering. And, too, more weathering than is necessary is apt to be rendered by artificial means, at the hand of inexperienced or careless persons.

When artificial means are necessary, the following method, which we have found satisfactory, is recommended:

> Swab with acetic acid (vinegar). Follow this immediately by washing the sheets *thoroughly* with water. Allow to *thoroughly* dry, then paint.

Ofttimes a mistake is made in trying to put on too heavy a coating which results in the paint flaking off much more than if a thinner coating were given. Be sure the sheets are *thoroughly* dry before painting as this is very often the cause for paint not holding to galvanized material.

To afford maximum protection to the entire installation, many architects specify painting with two coats, both inside and outside surfaces of all sheet metal parts, and also the structural iron framework. Also, they insist upon inside surfaces of closed pockets in ornaments being given a coat of primer before the ornaments are attached. These are added precautions that, when considering the small percentage of cost of the entire job, may really be considered good practice.

Because of varying climatic conditions, paint ingredients in different localities may require special treatment. For this reason paint specifications should be governed by local conditions.

Successful methods for creating a "stone" finish have been developed and are being used more and more frequently. In substance they consist of applying a coat of adhesive paint, followed by spraying with powdered sand.

Galvanized iron can be painted any color or shade of color desired, and can thus be made to harmonize perfectly with any scheme of color or surface treatment.

SOLDERING GALVANIZED IRON: Best grade 50-50 (zinc and lead) solder should be used, and well sweated into seams and locks where indicated, with an iron heated to the proper temperature.

Non-acid fluxes are recommended. However, if an acidic flux is used, extreme care should be taken to see that all traces of the flux are removed after soldering. As a means of absolutely preventing corrosion resulting from remaining acid, use a dilute soda wash after soldering, to neutralize the acid. Thorough drying should follow.

Exposed parts of sheets joined must be in tight contact at every point before soldering is begun. No putty or other similar filler should be allowed, nor should it be necessary. Solder is intended only as a means of water-proofing joints and holding

them in such close contact that paint will not crack. It should not be used as a filler.

To prevent destruction in event of fire, construction methods for all building parts (except circular work) covered in this manual are designed to be complete in their form and strength before solder is applied.

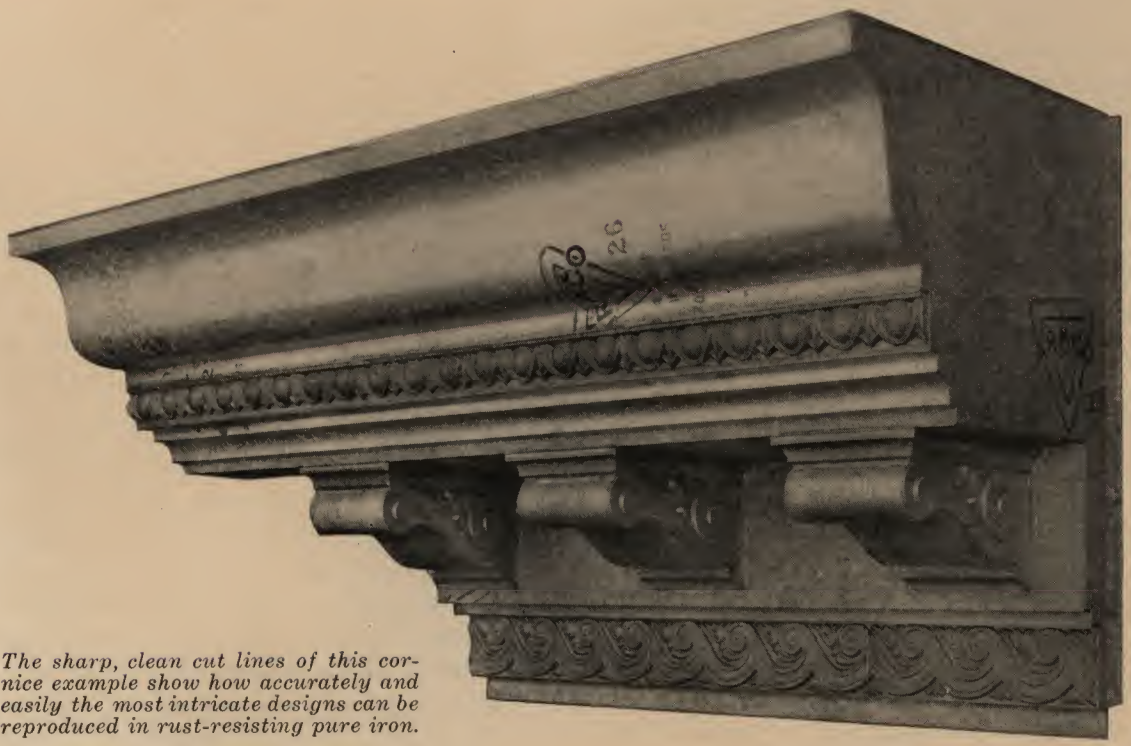
RIVETING, BOLTING OR NAILING GALVANIZED IRON: Galvanized iron rivets, bolts or nails should always be used with iron sheets for best results. In no instance should rivets, bolts, or nails of materials that are electro-negative to zinc or iron, be used in direct contact with galvanized iron sheets. Rivets are preferable to bolts when it is possible to use them, except where removal may be required.

Size of rivets, bolts, and nails depends on weight of sheets, number of thicknesses, and strain. Two pound rivets (so called because 1000 rivets weigh two pounds) are generally used for securing two thicknesses of cornice, marquise or skylight sheets.

Care should be taken in punching rivet holes, to see that they are not punched unnecessarily large, and that the galvanizing is not spalled around the opening.

All joints important to the strength of the part, should be riveted, bolted, spot-welded, clinched or locked, and not left to soldering. The only exception to this rule is in circular work.

CRIMPING GALVANIZED IRON: Large, flat surfaces in architectural sheet metal work, are generally crimped to enhance the appearance by providing depth. Also such surfaces may develop a wavy surface and crimping eliminates this and adds rigidity. Crimping should be 3/16" center to center, running either vertically or at right angles to the wall face, and usually in the direction of the short dimension of the sheet.



The sharp, clean cut lines of this cornice example show how accurately and easily the most intricate designs can be reproduced in rust-resisting pure iron.

Galvanized Iron Cornices—Details of Construction and Erection

Data Applying to All Types of Cornices

SUPPORTING STRUCTURE: When local regulations permit, it is most satisfactory to have structural supporting work included in sheet metal contractor's specifications, thus giving him opportunity to properly secure his work. This centralizing of responsibility for the entire job is most convenient.

However, when this is not possible, special caution should be written into sheet metal contractor's specifications, to examine the supporting structure before securing his work to it. Failure to do this should be no excuse for improper erection of his material. This pertains particularly to proper alignment of supporting members.

Lookouts and supports should have sufficient combined strength to support a load of 40 pounds per square foot of projected horizontal area of cornice, plus a concentrated load of 500 pounds on the extreme outermost portion of each lookout.

SECURING CORNICE: Each cornice member should be attached to each band iron brace by rivets or bolts with not less than one rivet or bolt in each cornice member.

SEAMS AND JOINTS: Various methods have been worked out by sheet metal contractors, many of which give satisfaction and have individual recommending features.

In any case, however, seams and joints should be so formed as not to hold water, either as a cup or by capillary attraction. A little thought will easily determine whether a method as detailed on shop drawings, is practicable. Exposed nail, rivet, or bolt heads, occurring on draining surfaces should be neatly soldered watertight.

The three main factors to consider are security, watertightness, and appearance from a reasonable distance.

Sizes of sections—width and length, generally should be left to the judgment of the sheet metal contractor, who will have to take into consideration the width and length of galvanized sheets available in the particular gauge specified, the size and weight of the cornice, and the best means of handling the sections in shop, in transit, and during erection.

Any reasonable provision that can be made for facilitating erection of larger sections, will make for better construction because joints made in the shop can be made more true and satisfactory than those on the job.

Except in circular cornice work, no dependence should be placed on solder for strengthening a joint. Its sole purpose is waterproofing.

Pocket seams, clinched edges, and notches which will prevent seams, joints, mitres, and the like from giving away when subjected to the heat of fire, or the stresses of expansion and contraction, should be accepted in lieu of riveting.

Longitudinal Cornice Seams: These should not be exposed except when necessary, as in circular work. How large sections should be depends, except in circular work, upon the stretchout size of the cornice and the width of galvanized iron sheets available in the gauge and length desired. Available sizes of various gauges of galvanized iron sheets are shown on page 49.

All longitudinal shop joints, except in circular work, should be seamed together by an approved lock seam in which each of the sheets is turned not less than 180 degrees. If either sheet turn through

less in the joint, the joined sheets should be riveted with 2 lb. galvanized iron rivets spaced not over 3″ o. c.

All longitudinal field joints should be made on a vertical member or at the intersection of such a member with a horizontal member.

Longitudinal Cornice Deck Seams: These should be avoided if possible and when necessary, joint should be cleated and flat locked, with lock turned in direction of flow.

Transverse Cornice Seams: While it is desirable to have as few such seams as possible, this also depends on the length of sheets available in the gauge desired. See page 49.

All transverse shop and field joints should be made over a band or be otherwise rigidly supported in approved manner. Formed sheets to be joined should be lapped at least 1¼″, secured together with 2 lb. galvanized iron rivets, and neatly soldered watertight, both inside and outside.

Transverse Cornice Deck and Gutter Lining Seams and Joints: Shop joints should be lapped, riveted, and soldered both inside and outside. Rivet heads should also be soldered watertight. Field joints should be cleated, flat locked, and soldered watertight. Seams and locks should be turned in direction of flow where they occur in gutter lining. Here also, the field locks should occur at high point between sumps, if possible.

Mitres: All mitres should be so formed (by cutting alone) that the joint lies entirely in the plane determined by the intersection of the members joined. All mitres should be true, strong, and tight-jointed before soldering watertight.

Securing Roof Deck Sheets: Sheet metal deck covering should be secured to supporting structure at intervals not to exceed 2′ o.c. longitudinally, and in the absence of end seams at such intervals, sheets should be secured to wood supporting structure by full barbed and dipped galvanized iron nails; to concrete with hardened masonry nails or lead plugs and screws, and to corrugated sheets with galvanized iron clips as shown on Drawing No. 3, page 19.

Attaching Ornaments: All ornaments, including brackets and modillions, should be riveted on with 2 lb. galvanized iron rivets, spaced not over 3″ o.c. or lock-seamed, clinch-edged, or otherwise attached in approved manner. All joints should then be soldered watertight. Each ornament should have at least three rivets.

All cornice members should continue as uninterrupted sheets behind brackets, modillions, dentils, placques, or other discontinuous ornaments, and behind all continuous ornaments made of zinc.

Drips and Drains: To prevent water that spills over the outer edge of cornice or parapet decks from running down the face of cornice or parapet and streaking it, drips should be formed by undercutting, or by making a hook seam as the case requires.

A drip should also be formed at the base of the foot molding to create a proper joint with the wall and also to drain outside the wall face, any water that may have run down that far.

Cornice decks and gutters should have a continuous fall to drainage points. It is very important that pockets do not occur, and the architect should call for a water test in the gutter specifications to guard against pockets or fall occurring in the wrong direction. A recommended minimum fall for gutters is 1/16″ in 12″ and for cornice decks, with soldered seams, ¼″ in 12″.

Fire-Stops of Galvanized Iron: These should be provided on all cornices having inflammable materials in their construction. And, in such cornices, they should occur at each party or fire wall, or (where the line of the party or fire wall does not intersect with the face of the building) at every 20 ft.

Stops should be flanged accurately to the profile of cornice so as to fit tightly to every member. They should be riveted to the cornice body with 2-pound galvanized rivets spaced not over 3″ o.c. and with not less than one rivet in each cornice member. Each stop should extend to and be fastened to the deck, and should be flanged and fastened tightly to the wall with approved masonry nails or other suitable fastenings.

Ornamental Top Cornice—Fireproof

DRAWING No. 1 shows the important details of building and erecting this type of galvanized iron cornice.

LOOKOUTS: Care should be taken by masons and sheet metal or structural steel contractor, to see that lookouts are accurately aligned, and equally spaced between ends of cornice. These members should be so nearly arranged to the contour of the cornice as to permit attaching the band iron braces in at least three places, yet they should not come closer than ½" to body of cornice at any point.

All lookout connections should have at least two rivets or bolts in each connecting member. Gusset plates may also be necessary to proper security in some instances.

Masons can complete the wall as the supports are built-in.

As an alternate method of securing built-in-wall braces to avoid cutting up wall so much, these braces can be placed vertically against the outside wall face, and can be held with tie-rods running entirely through wall and anchoring at rear wall face.

BAND IRON BRACES: If structural iron contractor is responsible for supporting work, he should be given sheet metal contractor's working details in order to form braces accurately, to general contour of cornice.

There should be a clearance of at least ¼" between cornice body and band iron braces, for any necessary adjustment of cornice body to true alignment.

A band should be attached in at least three places, to each lookout.

SECURING CORNICE: Expansion shells, for securing cornice base, should be placed at intervals not to exceed 2′ o.c., as detailed at bottom of the cornice, Item I.

The architrave or foot-mold, should then be set in place and closely drawn to wall facing.

Another method of securing the foot mold is to run the edge of the cornice body into masonry the width of one brick, and then turn the edge up 1". Of course, this method would only apply where masons are working with sheet metal contractor in completing their respective jobs. It would also require a drip to be formed at the foot mold. The flashing edge of the cornice body should be inserted in the raked-out joint of the masonry to a depth of about 1½", secured with a coiled metal wedge, and this joint should occur not less than 1" above the bottom of the drip. The raked-out joint should then be pointed up with cement.

Bolts to secure the cornice body to band iron braces should be inserted from the outside. If not counter-sunk, bolts should be round-headed to be least noticeable.

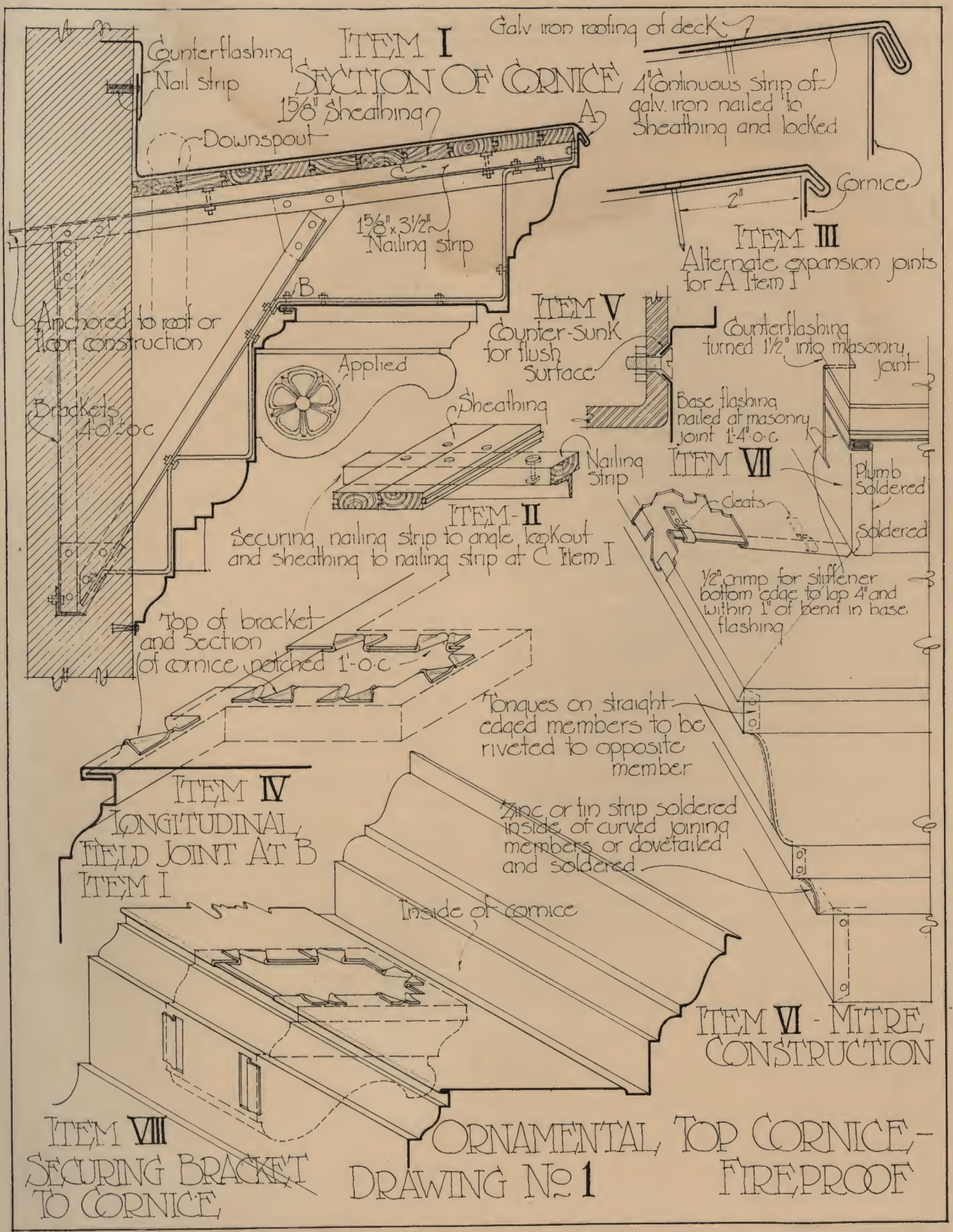
When work is near the ground, counter-sinking the bolt holes, as detailed in Item V and which gives a flush surface, is sometimes desirable. This method is costly and none too strong. Round head bolts are recommended whenever it is possible to use them.

The crown mold or upper course, fabricated complete from the upper cornice drip to the top of the lower course, is next set on the foot mold and secured to the band iron braces at top and elsewhere, as explained for the foot mold and as shown in Item I.

LONGITUDINAL FIELD JOINTS: As Item IV shows, both sections have been previously formed for the connection. A joint of this kind at the intersection of a vertical and a horizontal member is concealed.

As an added measure of precaution, the horizontal member just above the seam may be formed to provide a slight drip.

The formation of the two field joints for connecting the roof deck and top cornice course, detailed in Item III, provides a drip for draining water from the roof deck, away from the cornice face. Where it is desirable to have a smooth edge along crown mold, which requires a standard flat


ITEM I
SECTION OF CORNICE
Counterflashing
Nail strip
15/8" Sheathing
Downspout
A
B
15/8" x 3 1/2" Nailing strip
Anchored to roof or floor construction
Brackets 4-0" c-c
Applied
Sheathing
Nailing Strip
ITEM II
Securing nailing strip to angle, lookout and sheathing to nailing strip at C Item I
Top of bracket and section of cornice notched 1'-0" c-c
ITEM IV
LONGITUDINAL FIELD JOINT AT B ITEM I
Tongues on straight edged members to be riveted to opposite member
Zinc or tin strip soldered inside of curved joining members or dovetailed and soldered
Inside of cornice
ITEM VI - MITRE CONSTRUCTION
Galv iron roofing of deck
4" Continuous strip of galv. iron nailed to sheathing and locked
Cornice
2"
ITEM III
Alternate expansion joints for A Item I
ITEM V
Counter-Sunk for flush Surface
Counterflashing turned 1 1/2" into masonry joint
Base flashing nailed at masonry joint 1'-4" o-c
ITEM VII
Plumb Soldered
Cleats
Soldered
1/2" crimp for stiffener bottom edge to lap 4" and within 1" of bend in base flashing
ITEM VIII
SECURING BRACKET TO CORNICE
ORNAMENTAL TOP CORNICE - FIREPROOF
DRAWING No. 1

seam connection at this point, the ogee or top cornice course should be formed with an under-cut which will precipitate roof deck drainage away from the cornice face.

SECURING BRACKETS AND ORNAMENTS: To secure brackets to cornice body as detailed in Item IV and VIII, the planceer or ceiling of crown cornice mold should be cut at proper intervals, to the outline of the 1″ turned top edges of bracket, so making sufficient allowance on three sides of the cut, for the notches at intervals of 1′ o.c.

Where sides and bottom of bracket join main cornice body, vents should be cut in cornice body sheet, and tabs on the bracket edges should be projected through the vents, clinching inside the cornice body sheet. It is important that these vents do not occur more frequently than necessary and that they are not unnecessarily long, so as to preserve the strength of the cornice body.

See "Attaching Ornaments," under "Data Applying to All Types of Cornices," page 13.

MITRES: At all mitres, one member should be riveted into the snipped, projecting tabs of the other member as detailed in Item VI. These tabs should occur on all square-edged members. Rivets should be spaced not over ½″ from bend line in tab and not farther apart than 3″ o.c. There should be at least one rivet in every cornice member and they should be placed where least noticeable. Solder should then be applied inside to waterproof the joint.

Zinc or tin cleats or strips, ½″ wide and formed to the angle of the joint, should next be soldered to both joining curved members for the full length of these members, or else these joining members should be dovetailed and soldered.

ROOF DECKING: Though drawing No. 1 selects wood sheathing for the roof deck, where strictly fireproof construction is desired, corrugated, galvanized iron sheets may be used instead. Details pertaining to this type of roof decking are shown and explained in drawing No. 3, page 19.

Wood nailing strips should be secured to angle iron lookouts as detailed in Item II.

After nailing to the outer edge of roof deck, the metal strip for the joint, the galvanized iron roof deck sheets may be laid and formed to the joint. Item VII shows a satisfactory method of transversely joining roof deck sheets. Though longitudinal seams are not advisable on cornice decks, should one be necessary, this same type of joint will apply. Seams should always be turned in direction of flow and soldered watertight.

Allowance should be made for drainage sumps at intervals not to exceed 40′ o.c. The deck should also provide a two-way pitched surface with a fall of at least ¼″ in 12″ each way. The high points of cornice deck should be the outermost edge and half-way between sumps.

FLASHING ROOF DECK: Edge of roof deck sheets should be turned up on wall facing, not less than two courses of brick (enough to exclude water and standing snow from seeping through) and counter-flashed as shown at Item VII.

Cap flashing strip should be secured in masonry joint by coiled metal wedges, and the joint then pointed up with cement. It should lap at least 4″ and to within 1″ of the bend in base flashing. A ½″ crimp at the bottom of the cap flashing gives it the desirable stiffness and makes it lie close to side walls.

Locking flashing around corner: The method detailed in Item VII, can be used on any type of wall facing.

Ornamental Top Cornice—Wood Supports

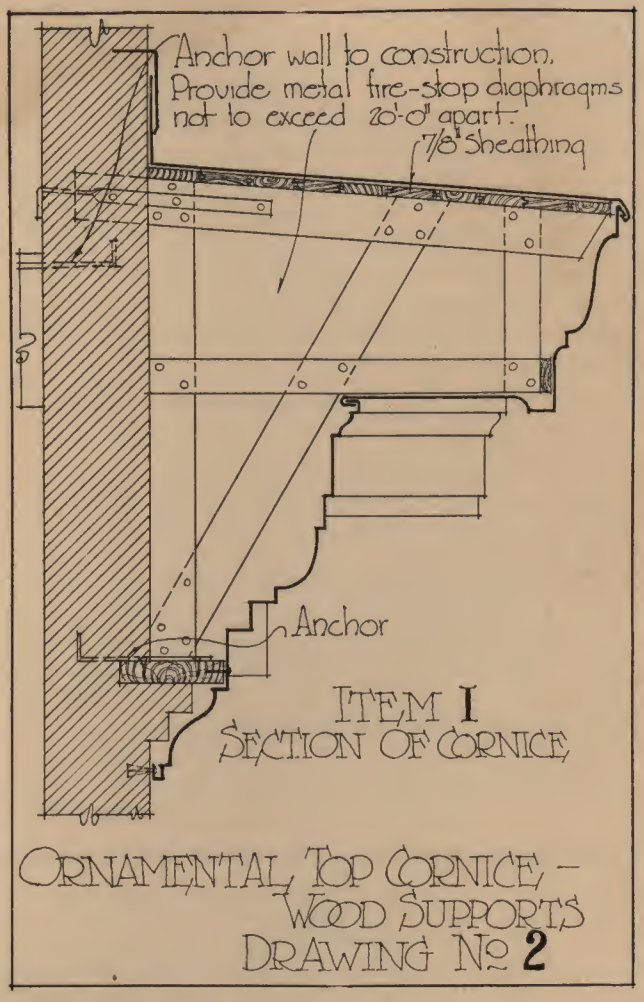
THIS cornice, illustrated in Drawing No. 2, can be constructed and erected exactly as the fireproof type in Drawing No. 1, page 15, so far as joints, miters, brackets, ornaments, decking, flashing, etc., are concerned. The only difference is in the supporting members and the method of securing cornice to these members.

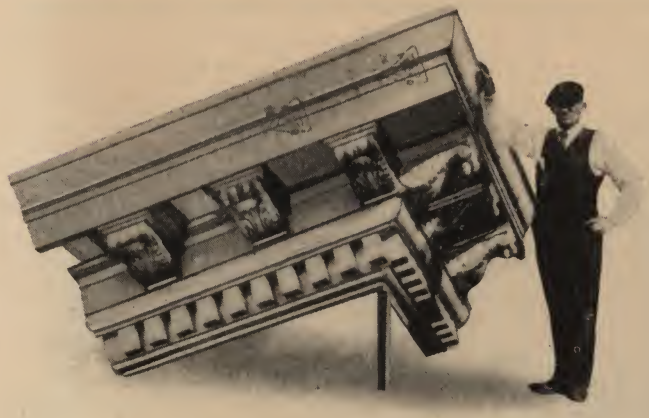
SUPPORTING STRUCTURE: Carpenters generally do all wood work, working from a detail usually supplied by the sheet metal contractor and approved by the architect.

Lookouts and other projecting wood supporting members should be of good quality, well-seasoned new spruce or yellow pine, or common grade of red or white oak.

Continuous wood supporting planks should be built into wall and secured by anchors, also built into wall, as shown at bottom of drawing. Lookouts should occur at 2′ intervals, each secured with anchor straps as shown at top of drawing, and with nails to supporting plank at the bottom.

Where connecting lookout members join they should be well nailed with galvanized iron nails of sufficient length to penetrate combined thickness of both joining members.





The entire profile of this pure iron cornice for the Y. M. C. A. building, Sioux Falls, S. D., was built in the shop and erected on the job in sections.

There should be a clearance of ½″ between cornice body and wood supporting members for any necessary adjustment of cornice body to true alignment and to prevent wood from igniting from heat of flames on outside of sheet, in event of fire.

SECURING CORNICE: Nails for securing cornice body to supporting structure should be placed where they will be least visible.

Cornice With Balustrade—Fireproof

MOST important of the features that differ in this example, Drawing No. 3, from previous ones are the larger size necessitating more substantial supporting structure, the balustrade in connection, corrugated galvanized iron deck sheathing, and the form of longitudinal joints. Also, as will be seen by comparing this example with the one illustrated in Drawing No. 1, there is less projection in proportion to height, which partly accounts for variation in plan of supporting structure. Strictly fire-proof construction is applied throughout.

See Drawing No. 1 for mitres, securing brackets, securing cornice, etc.

ROOF LOOKOUTS: These members should be pitched outward sufficiently to provide fall of ¼″ in 12″.

ROOF DECK: Standard 2½″ corrugated galvanized iron sheets should be laid on lookouts with corrugations running at right angles to lookouts. These sheets should be secured to the angle iron supports by clips placed through crests of corrugations as detailed in Item I, at intervals of 1′ o.c.

Standard corrugated sheets are available in 2½″, 1¼″, 3″, and 5″ wide corrugations (based on c.c. of ridges) but the 2½″ size is most commonly used, and will be quite satisfactory for cornice deck sheathing. Widths of 26″ and 27½″, and lengths of 5′, 6′, 7′, 8′ 9′, and 10′, are standard in the industry. Twenty-six gauge or heavier is recommended.

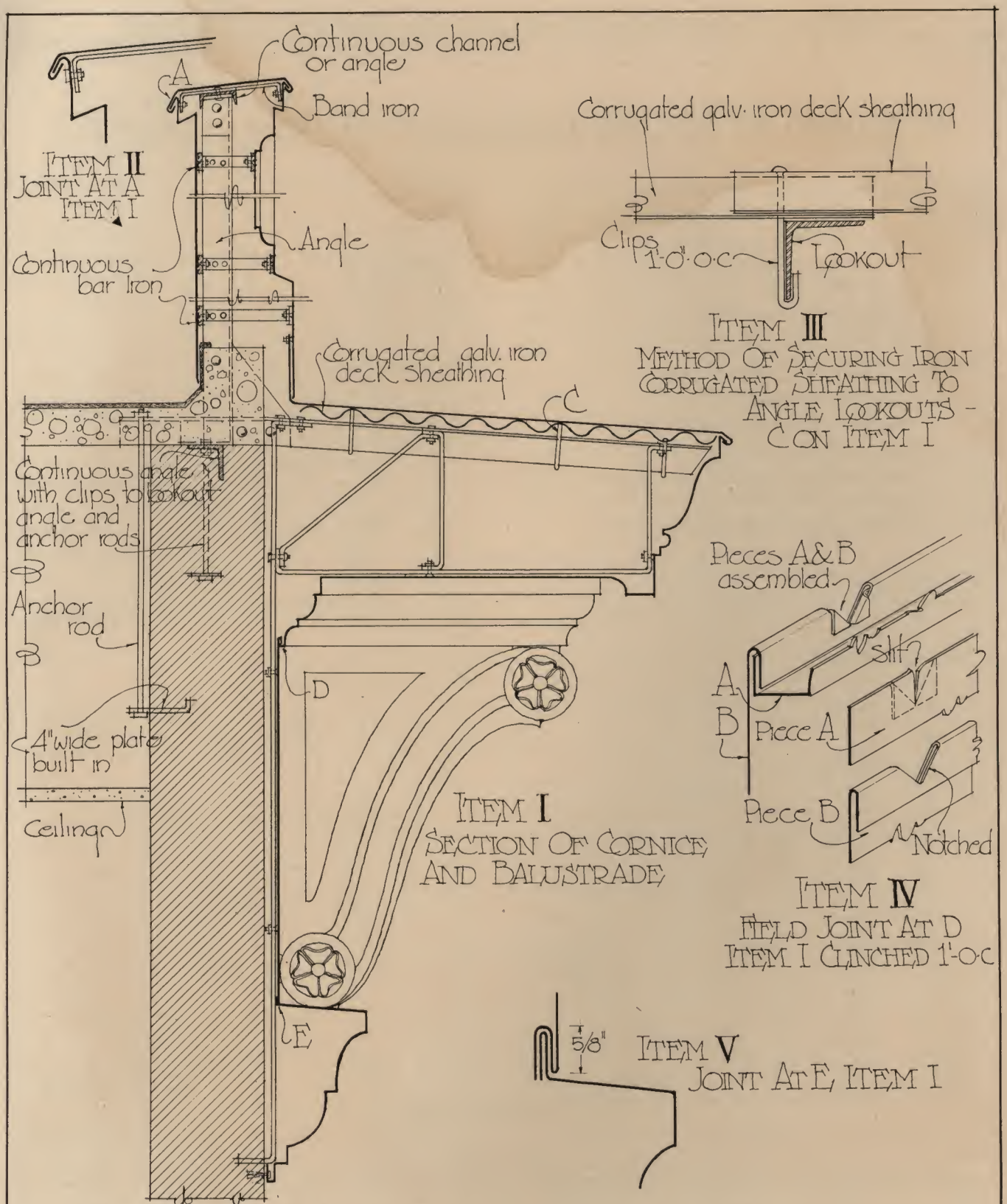
Concrete from the main roof should extend over end of lookout and around the gusset.

LONGITUDINAL FIELD JOINTS: The joint shown in Item V is of a different nature than anything heretofore shown. Its form, which allows the second or frieze course to rest its weight upon the lower course, makes it unnecessary to rivet or notch through the two joining members, particularly since the upper course is secured so tightly to the vertical band iron brace. The lower joining edge should be riveted to upright band iron supports.

Such a joint should be formed so that the edge of the lower course turns up ⅝″ into the fin or web formed on the other joining sheet, and all should be tightly drawn together.

Suitable longitudinal field joints for connecting the upper course and the roof deck are detailed in Drawing No. 1.

The tower, pediment cornice over entrance, and cornice across entire front of this Kentucky Masonic Widows and Orphans Home, Louisville, Kentucky, is made of ARMCO Ingot Iron. Architects—Joseph & Joseph, Louisville.



CORNICE WITH BALUSTRADE, – FIREPROOF
DRAWING No. 3

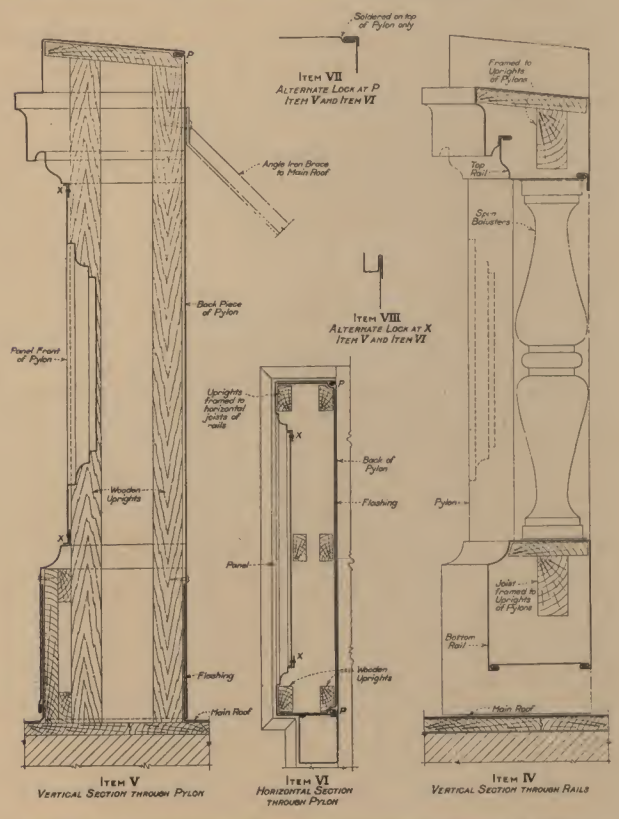
Cornice With Balustrade—Wood Supports

DISTINGUISHING this type of wood-supported cornice detailed in Drawing No. 4 from the one previously shown, are the lookouts formed by an extension of roof rafters, and the balustrade with one different joint at A.

WOOD LOOKOUTS: Beginning at outer wall face, top edge of roof rafters should be tapered out, to provide a pitch of not less than ¼″ in 12″.

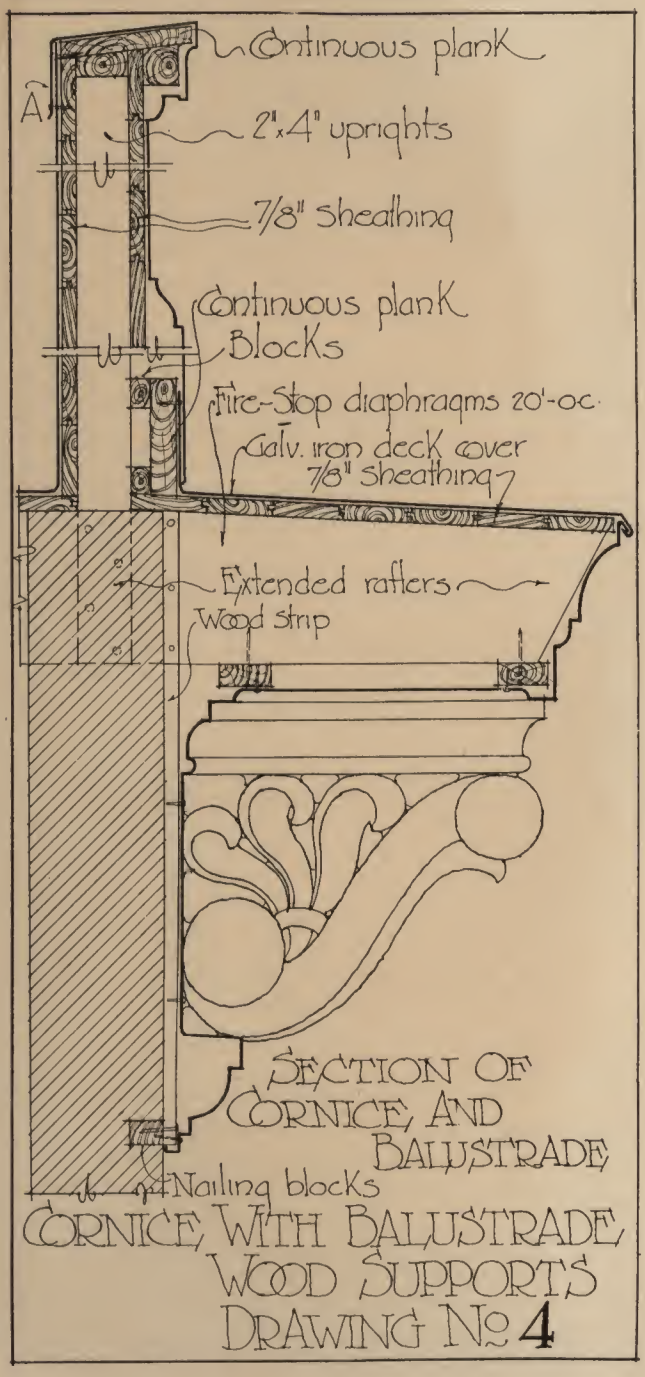
See "Supporting Structure," under "Ornamental Top Cornice—Wood Supports," page 17.

LONGITUDINAL FIELD JOINTS: At "A" on drawing, the top cover sheet should lap at least 4″ with an additional ½″ turned out at the bottom, and nails should be placed near bottom of lap.



While this drawing has no connection with the explanation given above, nor with the drawing to the right, some of its construction methods may prove helpful. It is shown here through courtesy of the National Association of Sheet Metal Contractors.

See Drawings Nos. 1 or 3 for other necessary joints.



Cornice With Gutter—Wood Supports

IN this example, Drawing No. 5, the roof of the building forming the main cornice deck, the cornice gutter, and a different type of longitudinal field joint, are the outstanding features.

For information on constructing miters and securing cornice and roof deck sheets, see Drawing No. 1 and accompanying text.

WOOD SUPPORT: The gutter bed is purposely narrowed to prevent ice from collecting, and also to allow ice to heave upward in expanding.

See "Supporting Structure," under "Ornamental Top Cornice—Wood Supports," for additional data that applies to this example.

LONGITUDINAL FIELD JOINT: The type of lock shown in Item II, while not secured directly to supporting structure prevents swelling or bowing in cornice members.

Details of other necessary joints will be found on Drawing No. 1.

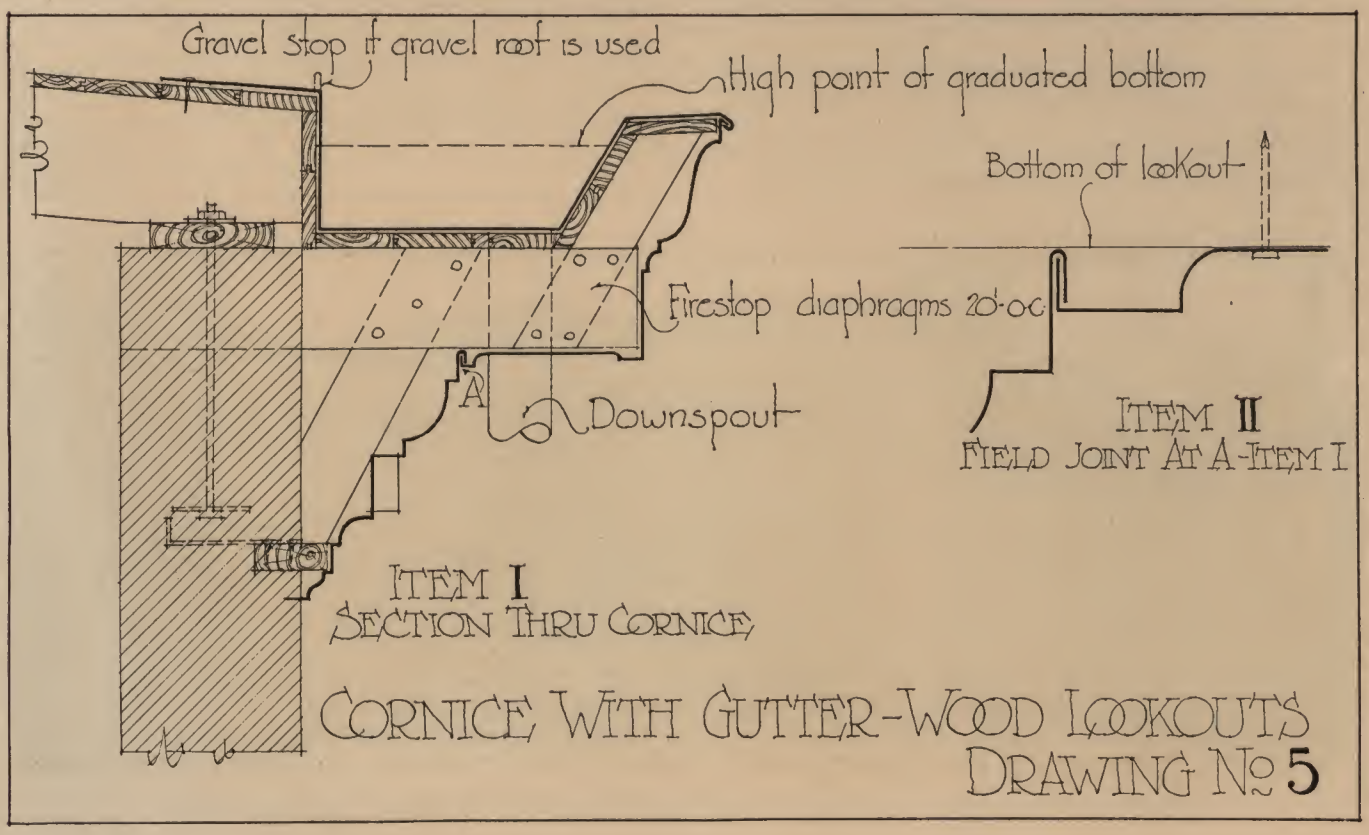
GUTTER LINING AND DRAINAGE: Sheet metal lining should extend onto main roof and there be flashed in approved manner.

A galvanized iron downspout sleeve provided with a flanged top edge (or other suitable drainage sump) should be placed at each drainage point, leading down to the conductor pipe.

See "Transverse Cornice Deck and Gutter Lining Seams and Joints," under "Data Applying to All Types of Cornices," page 12.

High points of gutter should be at least 1″ from top of outer side of gutter. This side of gutter should be at least 2″ lower than main roof deck, so in event of overflow, water will not back up on main roof.

Gutters of this type should have a minimum wall of 1/16″ in 12″, with high points halfway between outlets.



Fireproof Belt Cornice For Store Front

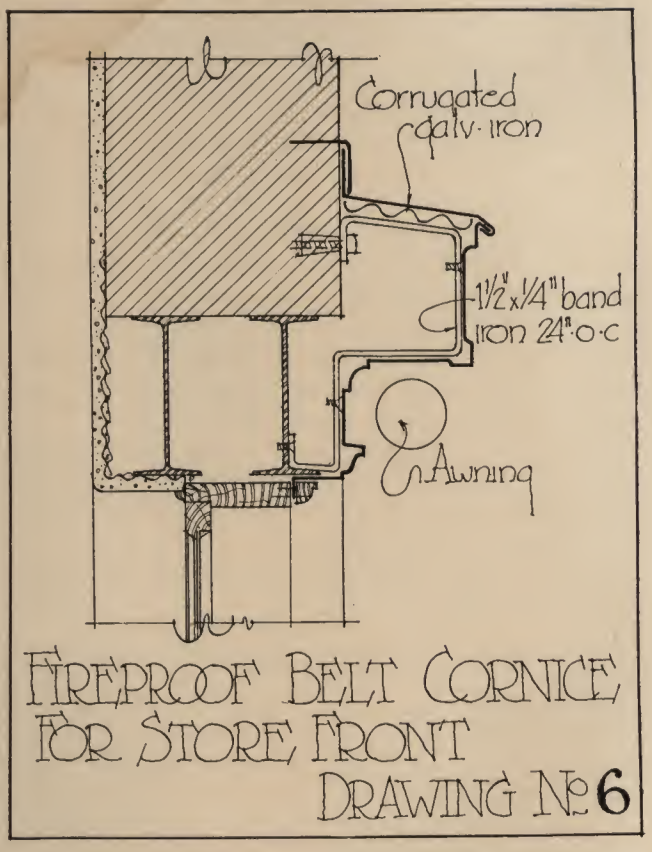
BESIDES the simplicity and economy of its supporting structure, this example—Drawing No. 6, of belt cornice for small and medium-sized commercial buildings, provides protection and concealment for the necessary awning that might otherwise detract from the building's appearance.

Projection of cornice and depth of foot mold is, of course, influenced by the type of awning.

Sheet metal is not strongly recommended for window sills or panels of store fronts, because of its susceptibility to knocks and bangs from the street.

For details and data on joints, mitres, supporting structure, and counter-flashing, see Drawing No. 1, and accompanying text.

SECURING CORNICE: Information on securing cornice to band iron braces is given under "Data Applying to All Types of Cornices," page 12, and "Ornamental Top Cornice Fireproof," page 14.



Twenty-six gauge ARMCO Ingot Iron belt cornice installed on a Cincinnati, Ohio, store front.

Galvanized Iron Coping

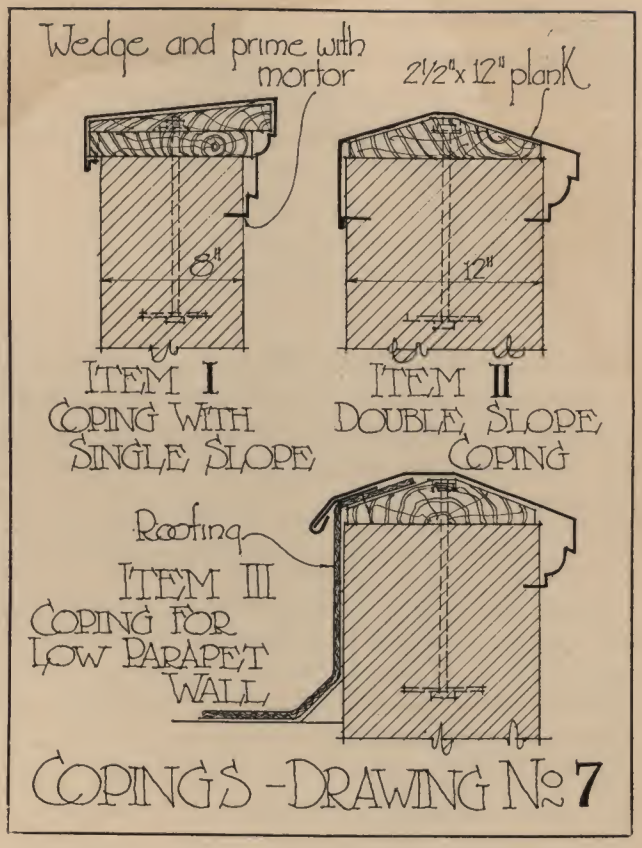
ALL three methods of galvanized iron coping construction shown in drawing No. 7 will give adequate weather protection to masonry joints, and they can be adapted to practically any straight line parapet wall.

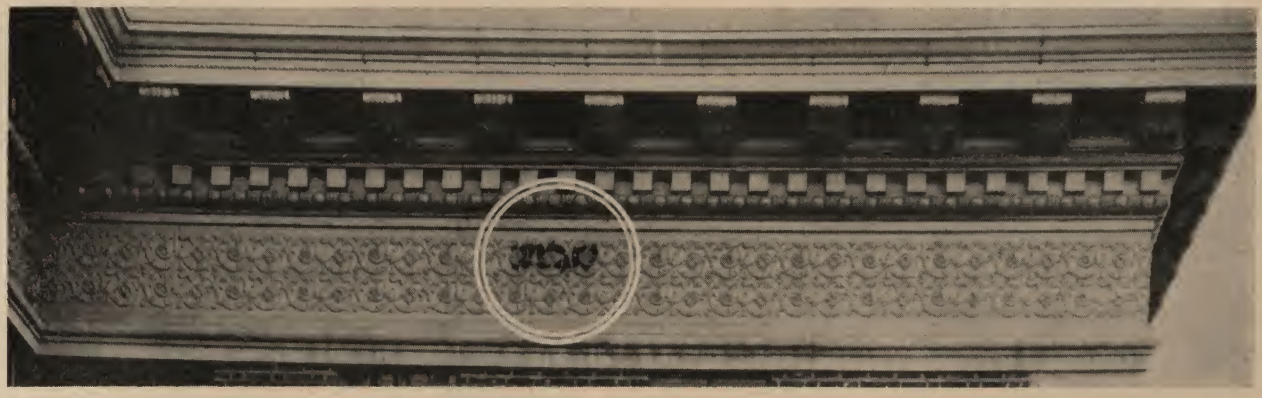
For circular coping, both vertically and horizontally curved, the detail in drawing No. 8 and accompanying text will be helpful.

DRIPS: Where the sheet turns into raked-out masonry joint a drip should be formed unless the design of the member immediately above this joint is formed to provide a drip.

TRANSVERSE SEAMS: Sheets should be lapped not less than 1¼", riveted with 2 lb. galvanized iron rivets, and soldered watertight. Rivet heads should also be soldered watertight on top draining surface.

SECURING IN MASONRY: Edge of sheet should extend 1½" into raked out masonry, be secured by coiled metal wedges and pointed up with cement.





An unusual feature of this ARMCO Ingot Iron cornice on the Belvedere Apartment Building, Cincinnati, Ohio, is the concealed attic ventilators, shown in the circle. This main cornice is five hundred and twenty-three feet long, eight feet high, projects three feet, and has a stretchout width of fifteen feet. Architect—C. H. Ferber.

Curved Cornices

DRAWING No. 8 details the method of constructing both horizontally and vertically curved cornices. To build and erect this type of cornice to a true circle and with satisfactory construction throughout, the cornice must be completely built up—every member, horizontal and vertical, must be a separate unit. Joints ordinarily used for straight work will not apply in this type of cornice.

In view of this and the care that must be given to securing joints, it is advisable and usually necessary to have all longitudinal joints, except the one connecting cornice with roof deck, done in the shop.

Horizontally Curved—Fireproof

Horizontal members should be cut to the curve and the desired width. Of course, the length of each cut will be determined by the radius of the cornice circle and the economical limitations of cutting from the width and length of sheets available in the gauge desired. See page 49 for available sizes and gauges of galvanized iron sheets.

Curved concave vertical members should be so formed by "raising" or "hammering" in a die built to the desired profile.

SUPPORTING STRUCTURE: There is no particular difference in the plan for this type cornice than for the straight work, except that roof deck boards must be cut to the curve, front and back.

LONGITUDINAL JOINTS: All these joints should be made according to the detail on drawing. All curved vertical members can be turned into the horizontal plane at both edges as much as ¼". This requires a draw on the metal along the edges that it will stand satisfactorily if the turn does not exceed ¼" wide.

Horizontal members should then be placed underneath the horizontally turned edges of joining members, and soldered watertight and securely.

This is the one place where solder must be relied upon to give strength to a joint.

Where the cornice body joins the roof deck a ¼" horizontal soldering edge should be turned back from the curved vertical member of the cornice body. A common flat seam joint as detailed in Item III can then be used. An alternate method in lieu of Item III is shown in Item IV.

TRANSVERSE JOINTS: Where these occur, the turned up soldering edges of joining members are cut away 1½" or the width of the lap, so that only two thicknesses occur at these joints.

Vertically Curved—Wood Supports

The method of cutting and forming cornice members for the horizontally curved cornice is reversed in the vertically curved type.

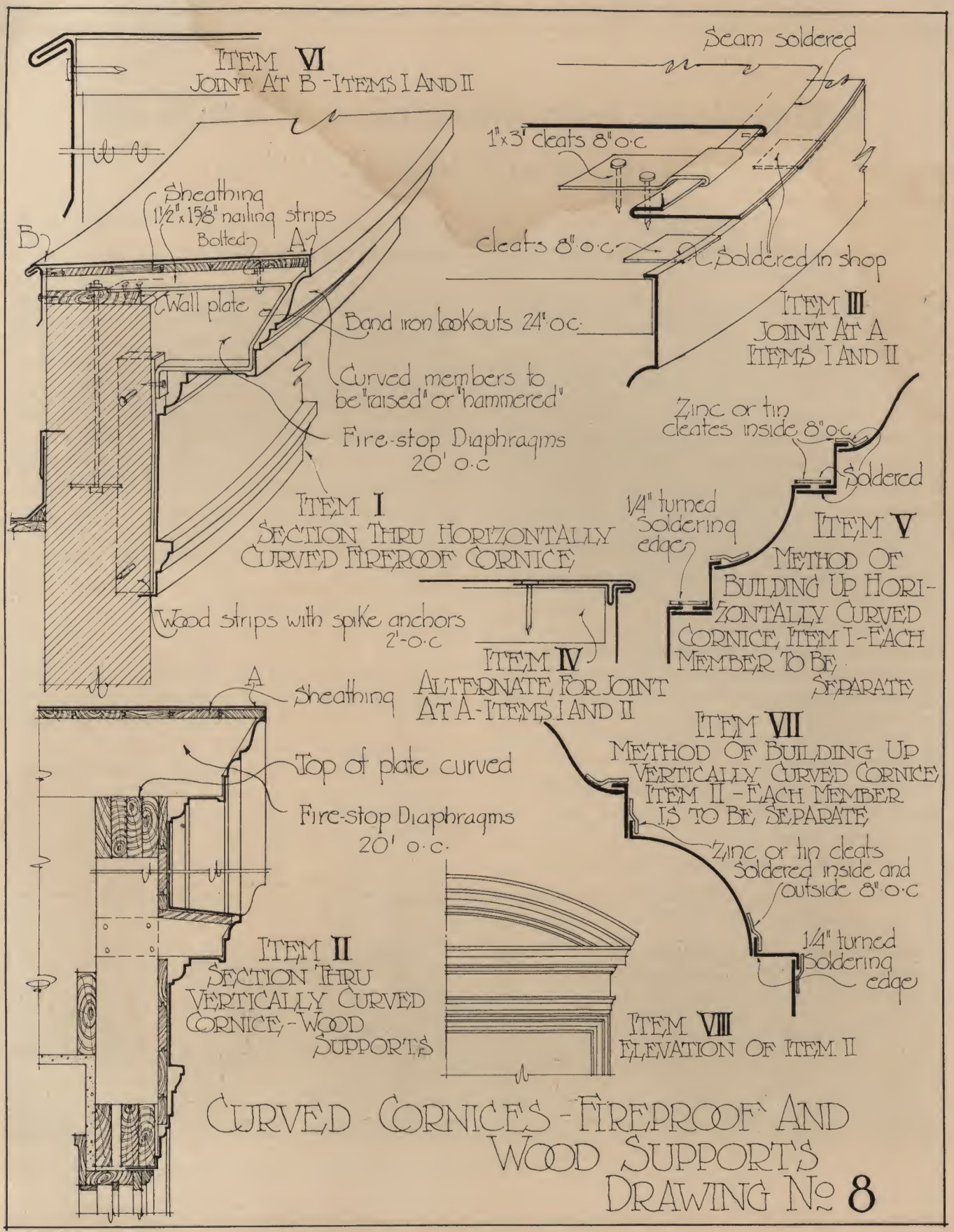
Vertical members are cut to the curve and horizontal members are formed to this radius. In this statement, concavely or convexly raised members are considered to be in the vertical plane.

SUPPORTING STRUCTURE: Item II shows one way of building the supporting structure for this type of cornice. This, of course, depends entirely on the design of the building.

LONGITUDINAL JOINTS: Because of the raised members in this example, and particularly the member raised both concavely and convexly, there is some variation as to which members are turned to form the soldering edge. Item VII details the method of building up longitudinal joints.

Items III and IV detail alternate methods of joining the top of the curved cornice body and the roof deck sheet.

TRANSVERSE JOINTS: Information given under this sub-heading for "Horizontally Curved Cornice," also applies here.


ITEM VI
JOINT AT B - ITEMS I AND II
Sheathing
1½"x1⅝" nailing strips
Bolted
B
A
Wall plate
Band iron lookouts 24" o.c.
Curved members to be "raised" or "hammered"
Fire-stop Diaphragms 20' o.c
ITEM I
SECTION THRU HORIZONTALLY CURVED FIREROOF CORNICE
Wood strips with spike anchors 2'-o.c
Seam soldered
1"x3" cleats 8" o.c
cleats 8" o.c
Soldered in shop
ITEM III
JOINT AT A
ITEMS I AND II
Zinc or tin cleates inside 8" o.c.
Soldered
1/4" turned soldering edge
ITEM V
METHOD OF BUILDING UP HORIZONTALLY CURVED CORNICE, ITEM I - EACH MEMBER TO BE SEPARATE
ITEM IV
ALTERNATE FOR JOINT AT A - ITEMS I AND II
A
Sheathing
Top of plate curved
Fire-stop Diaphragms 20' o.c.
ITEM VII
METHOD OF BUILDING UP VERTICALLY CURVED CORNICE, ITEM II - EACH MEMBER IS TO BE SEPARATE
Zinc or tin cleats soldered inside and outside 8" o.c
1/4" turned soldering edge
ITEM II
SECTION THRU VERTICALLY CURVED CORNICE - WOOD SUPPORTS
ITEM VIII
ELEVATION OF ITEM II
CURVED CORNICES - FIREPROOF AND WOOD SUPPORTS
DRAWING No 8

Galvanized Iron Marquise—Details of Construction and Erection

Data Applying to all Types of Marquises

SEE "Data Applying to all Types of Cornices," page 12, for such information as would apply equally to marquise work.

PROJECTION AND HEIGHT: While marquises fall readily into two classes—the Entrance Canopy and the Show Window Shelter—they have been classified in this manual according to construction, and any method thus shown can be applied to either of the types of application. It must be remembered that building codes differ in amount of permissable overhanging projection, the height of such structures from the street level, the manner of securing them, and the materials used in their construction.

PITCH AND DRAINAGE: The pitch may be inward or outward to provide proper drainage, but construction is favored by inward pitch to drainage gutter. And this is generally obtained by pitching roof deck by means of graduating depth of joists or corresponding parts, rather than by pitching the entire structure.

The crown mold deck should also be pitched inward so that least possible dripping will occur on pavement below.

COORDINATION OF TRADES: Sheet metal contractor should work with structural iron, wood, electrical, and sign contractors, in order that proper provision may be made for the work of each, without unnecessarily delaying any.

Wood furring strips should be furnished and erected by the sheet metal contractor since these parts influence proper erection of his work.

Glass work should also be furnished and erected by sheet metal contractor for similar reasons.

SEAMS AND JOINTS: Except where other kinds are detailed, the types of longitudinal, transverse, and mitre joints, detailed for cornice examples for buildings, will apply equally to marquise cornices.

Because marquises are so near the ground, special attention should be given to neatness—forming, joints, rivets, solder, etc. Counter-sunk bolt-heads find their best use on marquise work, provided the architect is willing to forego the greater security and economy of the round-head.

EMBELLISHMENTS: Since ornamentations vary so widely it would be impossible to set forth any definite details of construction that would apply generally. Usually the information in the cornice section under subheading of "Attaching Ornaments," page 13, will apply equally to marquises.

This ARMCO Ingot Iron marquise was installed in 1922 on the Palace Theater, South Bend, Indiana.

Straight Marquise With Galvanized Iron Roof

DRAWING No. 9 shows the important details of building and erecting this type of galvanized iron marquise.

SUPPORTING STRUCTURE: An I-beam, forming the main supporting member and running continuously the entire length and width of the marquise, should be secured to the wall as shown in Item VIII, or otherwise secured in approved manner. The method shown secures the I-beam against movement either way.

Where the two I-beams join, they should be bolted together with clips and gusset plates as detailed in Item IX. Joists tapered in the direction of drainage, should be placed 16″ o.c., the one end built into the wall and the other toe-nailed into the nailing strip that is bolted to the I-beam at the outer edge.

The lookout arrangement for supporting the cornice cover should occur at intervals of 16″ o.c. or at each joist.

Attaching Eyebolt: Item X shows a good method of attaching eyebolts.

DRAINAGE: While Item I shows the marquise pitched toward the outer edge to drain into the street through a gargoyle, it may be pitched toward a gutter at the wall as the dotted line indicates.

As already stated, joists are tapered in the general direction of drainage. If they are tapered to drain water outward, joists should also be beveled from the center outward so to pitch the roof toward each side where it may drain into the sumps.

JOINTS: Should any additional information be desired than is shown in details, see text on this subject under "Ornamental Top Cornice—Fireproof," page 14. Where the ceiling molding joins the wall face, it should be turned 1½″ into masonry, secured with coiled metal wedges, and pointed up with cement.

Where cornice body abutts against the wall face, it should be drawn closely, and in cases of extremely irregular wall surfaces, the edges of cornice body should be trimmed to the contour of wall surface.

See "Securing Cornice," under "Ornamental Top Cornice—Fireproof," page 14, for additional data.

SECURING CEILING PANEL MOLD: At proper intervals these parts, cut exactly to size and having the edges formed to the locks for securing panel sheets, should be nailed to wood furring strips, as already explained and as shown in Item VII.

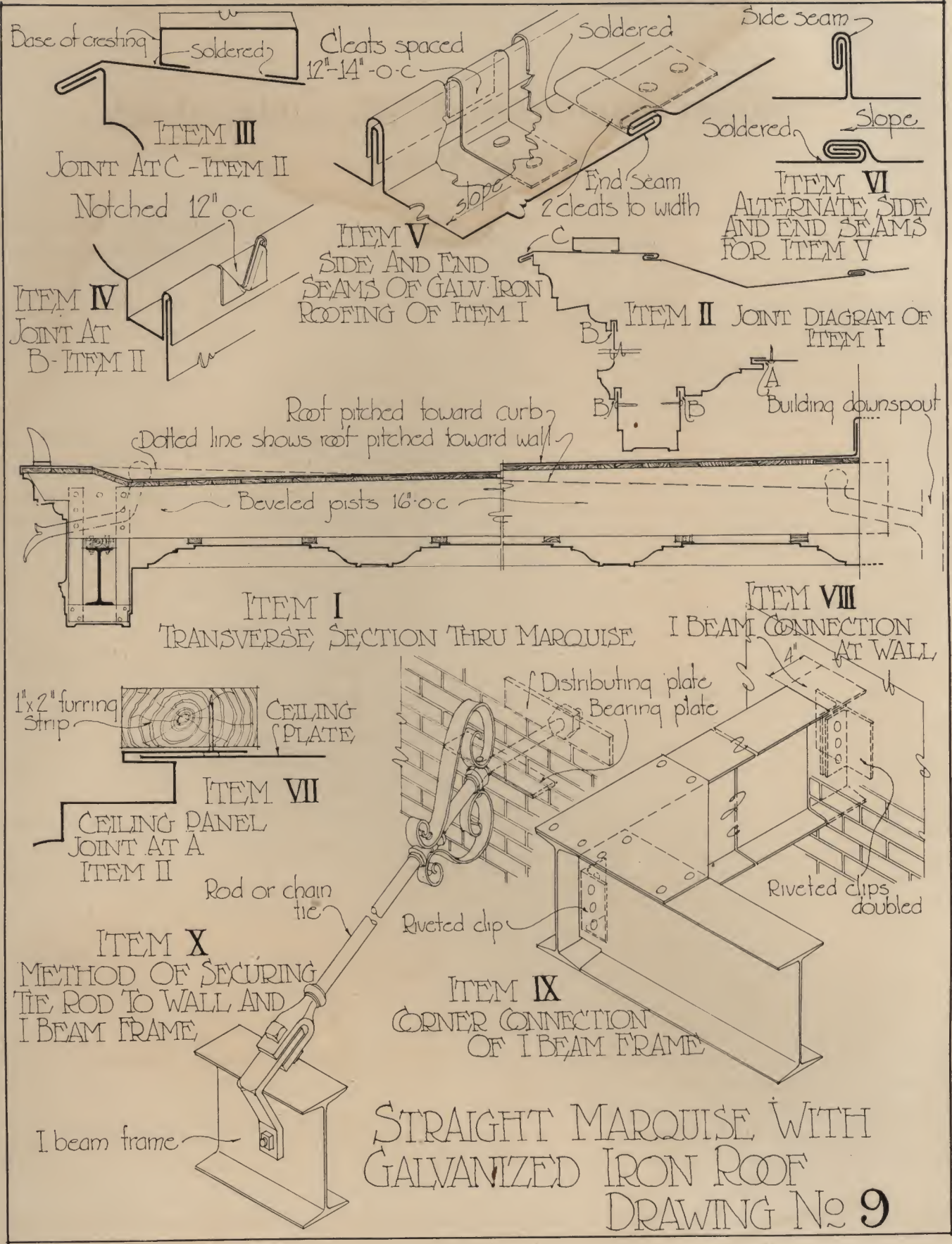
INSERTING PANEL SHEETS: Sheets cut exactly to size and long enough to extend well into the joining webs formed on the panel molds, should first be inserted into one joint web. Then the other edge should be inserted in the web provided for it, by flexing the sheet and allowing it to spring into place in a flat position.

SECURING ROOF DECK: Items V and VI show methods of forming roof deck joints and securing galvanized iron cover to sheathing boards. Seams should be turned in direction of flow.

FLASHING: At the wall line the roof deck cover should be turned up on wall face and flashed or counter-flashed in approved manner. See Item VII, Drawing No. 1, page 15, and accompanying text.

Where the eyebolt projects through roof deck, a flashing collar should be used.

ORNAMENTATIONS: See "Embellishments," under "Data Applying to all Types of Marquises," page 26.


Base of cresting
Soldered
ITEM III
JOINT AT C - ITEM II
Notched 12" o.c
ITEM IV
JOINT AT
B - ITEM II
Cleats spaced
12"-14" - o.c
Soldered
Slope
End Seam
2 cleats to width
ITEM V
SIDE AND END
SEAMS OF GALV IRON
ROOFING OF ITEM I
Side seam
Soldered
Slope
ITEM VI
ALTERNATE SIDE
AND END SEAMS
FOR ITEM V
C
B
ITEM II JOINT DIAGRAM OF
ITEM I
A
B
Building downspout
Roof pitched toward curb
Dotted line shows roof pitched toward wall
Beveled posts 16" o.c
ITEM I
TRANSVERSE SECTION THRU MARQUISE
ITEM VIII
I BEAM CONNECTION
AT WALL
4"
Distributing plate
Bearing plate
1"x 2" furring
Strip
CEILING
PLATE
ITEM VII
CEILING PANEL
JOINT AT A
ITEM II
Rod or chain
tie
Riveted clip
Riveted clips
doubled
ITEM X
METHOD OF SECURING
TIE ROD TO WALL AND
I BEAM FRAME
ITEM IX
CORNER CONNECTION
OF I BEAM FRAME
I beam frame
STRAIGHT MARQUISE WITH
GALVANIZED IRON ROOF
DRAWING No 9

Horizontally Curved Marquise With Skylight Roof

BESIDES the circular design and its application to a building corner, which distinguish this type of marquise detailed in Drawing No. 10, the example also shows a skylight roof and glass pendants, and it is built entirely without the use of wood.

All glass work including pendants and the lettering on them if lettering is desired, should be included in the sheet metal contractor's specifications. This centralizing of responsibility assures most satisfactory construction without unnecessary delays and possible misunderstanding.

SUPPORTING STRUCTURE: Supporting the band iron gutter form for the full length of the marquise in both directions, is a channel, formed to the angle of the building corner.

Side channels should extend into masonry.

Construction is favored in placing turned edges of channels outward, by providing a flat working surface inside, and other advantages shown in Item IV.

Band iron lookouts formed to the general contour of the cornice should be bolted to channel support at intervals of 2′ entirely around outer edge of marquise.

A slightly different method of securing the eyebolt for supporting chain, than shown in other marquise drawings, is given in Item VI.

BUILDING CORNICE: Under the title, "Curved Cornices," page 24, detailed information is given in text and illustration, for building the horizontally curved cornice on this marquise.

SECURING CORNICE: As few bolts should be used as is practicable for a secure job and these should be placed where least conspicuous, but also consistent with proper security. If the size of the marquise requires more joints in the cornice body, applicable joints will be found in other drawings.

SECURING PENDANTS: Items VIII and IX show methods of securing different types of glass pendants.

In both examples the pendant holders are formed in two sections—one fitting closely into the other. The outside or encasing section is first bolted inside the cornice body sheet—the bolt being inserted from outside as shown on drawing.

For the type of pendant illustrated in Item VIII, one edge of the outside section of holder is turned under to form a base or support for the shoulder of the pendant. Also, the back of this section can be made to form continuous support for the top of the glass. Such construction would avoid making the outside section of the holder in two pieces, with the attending difficulty of proper spacing.

To remove glass pendant from either holder, all that is necessary is to loosen bolts.

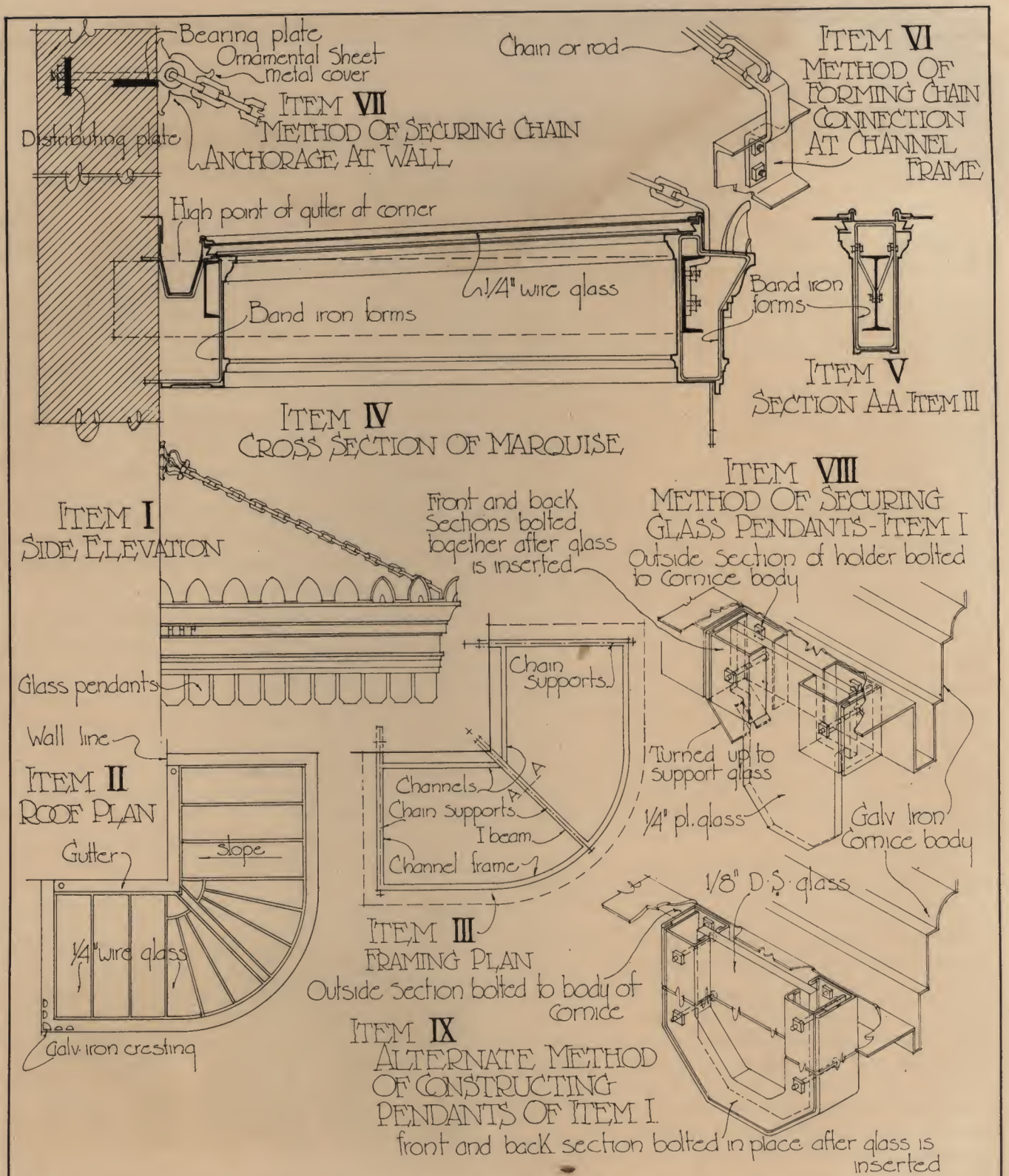
ORNAMENTATIONS: Whatever type of ornamentation that is chosen for around top of cornice, should be high enough to hide the eyebolt for securing supporting chain.

See "Embellishments," under "Data Applying to all Types of Marquises," page 26.

SKYLIGHT BARS: Details of this construction in sealed design, are given in skylight section, Drawing No. 13, page 37.

FLASHING: See Item VII, Drawing No. 1, and accompanying text for details.

This horizontally curved ARMCO Ingot Iron marquise on the Main Street Theater, Kansas City, Missouri is a splendid application of much of the detail shown in Drawing No. 10, page 30.



HORIZONTALLY CURVED MARQUISE WITH SKYLIGHT ROOF

DRAWING No 10

Rectangular Marquise With Vertical Curve

DRAWING No. 11 details this type of galvanized iron marquise, with a double-pitched, puttied skylight roof that drains to a gutter on each side. Note the strictly fireproof construction.

SUPPORTING STRUCTURE: For so small a marquise as is shown by this drawing, a 10 gauge pressed iron sheet will suffice for the main supporting member. This sheet forms a continuous support for all sides of the marquise. In the front, to back up the vertical curve, it slopes to an obtuse angle as shown in the elevation view. At the wall face the turned ends of this pressed iron support are extended into masonry.

Joints of this main supporting member are welded, and further supported by clips, either welded or bolted inside the angle of the joint.

Band iron lookouts bolted to pressed iron main support at intervals of 24″ o.c. and formed as shown on drawing, serve the dual purpose of supporting the cornice and the gutter lining.

BUILDING THE CORNICE: Under the title, "Vertically Curved Cornice," page 24, detailed information is given in text and illustration, for building the vertically curved section of this marquise cornice. How to form the mitre is also shown in the cornice section of this manual, Drawing No. 1, Item VI.

SECURING CORNICE: As few bolts should be used as is practicable for a secure job, and these should be placed where least conspicuous, but also consistent with proper security. If the size of the marquise requires more joints in the cornice body, applicable joints are shown in other drawings.

Connecting the curved part of the cornice body and the curved part of the cornice deck is a common standing seam. Note that while the cornice deck outside the standing seam as well as the seam itself, are formed to the radius of the curve, the deck between the seam and skylight curb is flat.

GUTTER LINING AND DRAIN: Item II, being a section through B-B in the plan, shows a common standing seam to connect the cornice body sheet and the gutter lining.

Water from the skylight panes drains over puttied skylight curb and the main curb and thence into the gutter by way of the drip joint at that point.

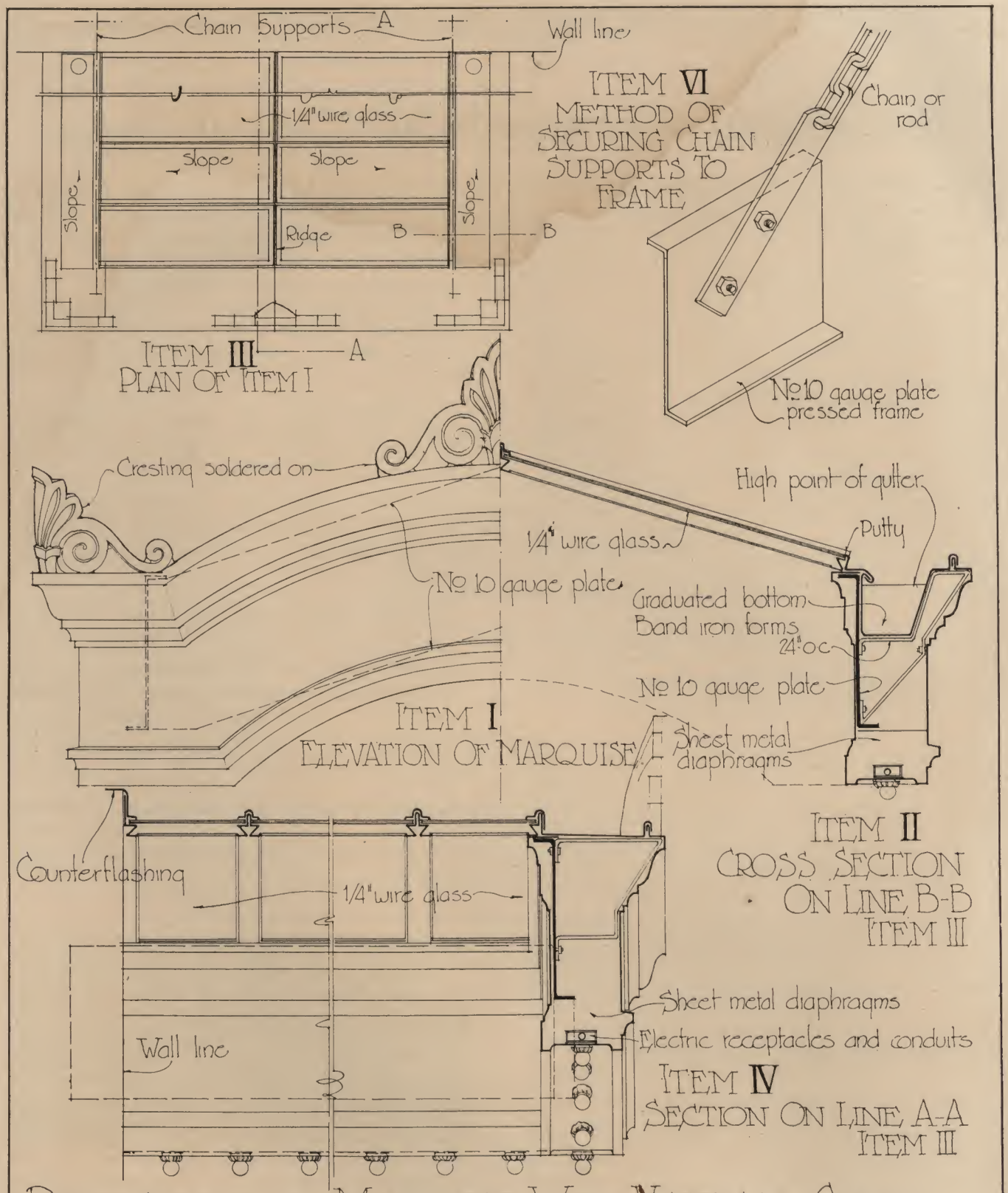
Gutters end with dead ends, and conductors leading from bottom of gutter at ends abutting wall face are built into masonry wall.

Dead ends of gutters that abutt against masonry wall should be counter-flashed into masonry in approved manner. See Item VII, Drawing No. 1, page 15.

SKYLIGHT BAR, CURB, AND RIDGE: Complete details of the sealed skylight construction as used in this marquise example, are given in text and illustration in the skylight section, Drawing No. 13, page 37. Should unsealed skylight construction be desirable, Drawing No. 14 details the method of construction.

WIRING, FIXTURES, AND ORNAMENTS: Because these are matters of individual choice and requirement, no attempt is made to offer definite details pertaining to them.

Vertically curved ARMCO Ingot Iron marquise with skylight roof on the Doctor's Building, Covington, Kentucky. Contractors—Northcutt Bros., 226 West 12th Street, Covington



RECTANGULAR MARQUISE WITH VERTICAL CURVE
DRAWING No 11

Galvanized Iron Skylights—Details of Construction and Erection

Data Applying to All Types of Skylights

WITH a few exceptions, bar and curb construction of various types is all the detail necessary to insure proper construction of any of the most commonly used types of skylights.

Curb construction is illustrated in Drawing No. 12, and details of sealed and unsealed bar construction are shown in Drawings Nos. 13 and 14, respectively.

Commonly used types of skylights are illustrated with elevation views on Drawing No. 15, while details for constructing unusual parts of these various types are shown in Drawings Nos. 16A and 16B.

SIZE OF BARS AND GAUGE TO USE: While some advocate 1¾″ (high) bars for short lengths, and increase the height to 2″ for larger types, the difference is so slight as to have little effect.

We recommend 2″ bars as standard, and increased weight of sheets, core plates, or structural iron frame, with the increased span of bars. Following is a scale of gauges that will provide adequate strength for most skylight needs:

Length of Bar	Gauge to Use
4′ to 6′	26
6′ to 8′	24
8′ to 10′	26 with ⅛″ core plate
Over 10′	26 with structural iron frame

Of course, these gauges are approximate and the difference of an inch or two need not necessarily require a heavier sheet. The gauges shown are the necessary weight for the desired strength only, and where service conditions are especially corrosive, heavier gauges should be used.

CAUTION TO CONTRACTOR: Special caution should be written into sheet metal contractor's specifications, to examine curb construction before securing his work to it. And unsatisfactory construction should be reported promptly. Failure to do this should be no excuse for improper construction of his work.

GLASS: While drawings indicate ¼″ rough wire glass, there is no intention of recommending any particular type or make of glass. Numerous satisfactory grades are available, many of these being designed for particular needs and conditions.

A length of approximately 72″ and width of 24″ are the recommended maximum dimensions for a single pane. Besides assuring sufficient bearing support for the area of glass, such a limitation also proves an economical measure in case of broken glass.

PITCH: Drainage surfaces of single pitch skylights should have a minimum fall of 2 in 12. However, a fall of 4 in 12 is most commonly used, and is preferable. Hipped or double-pitched types should provide a minimum fall of 6 in 12.

CONDENSATION DRAINAGE: "Weepers" or drainage holes, ¼″ in diameter, should be provided as shown in Items I and II, Drawing No. 13, and Items I and IV, Drawing No. 14, one weeper to a pane. These are essential to both sealed and unsealed construction.

Skylight Curb Construction

DRAWING No. 12 shows construction of curbs.

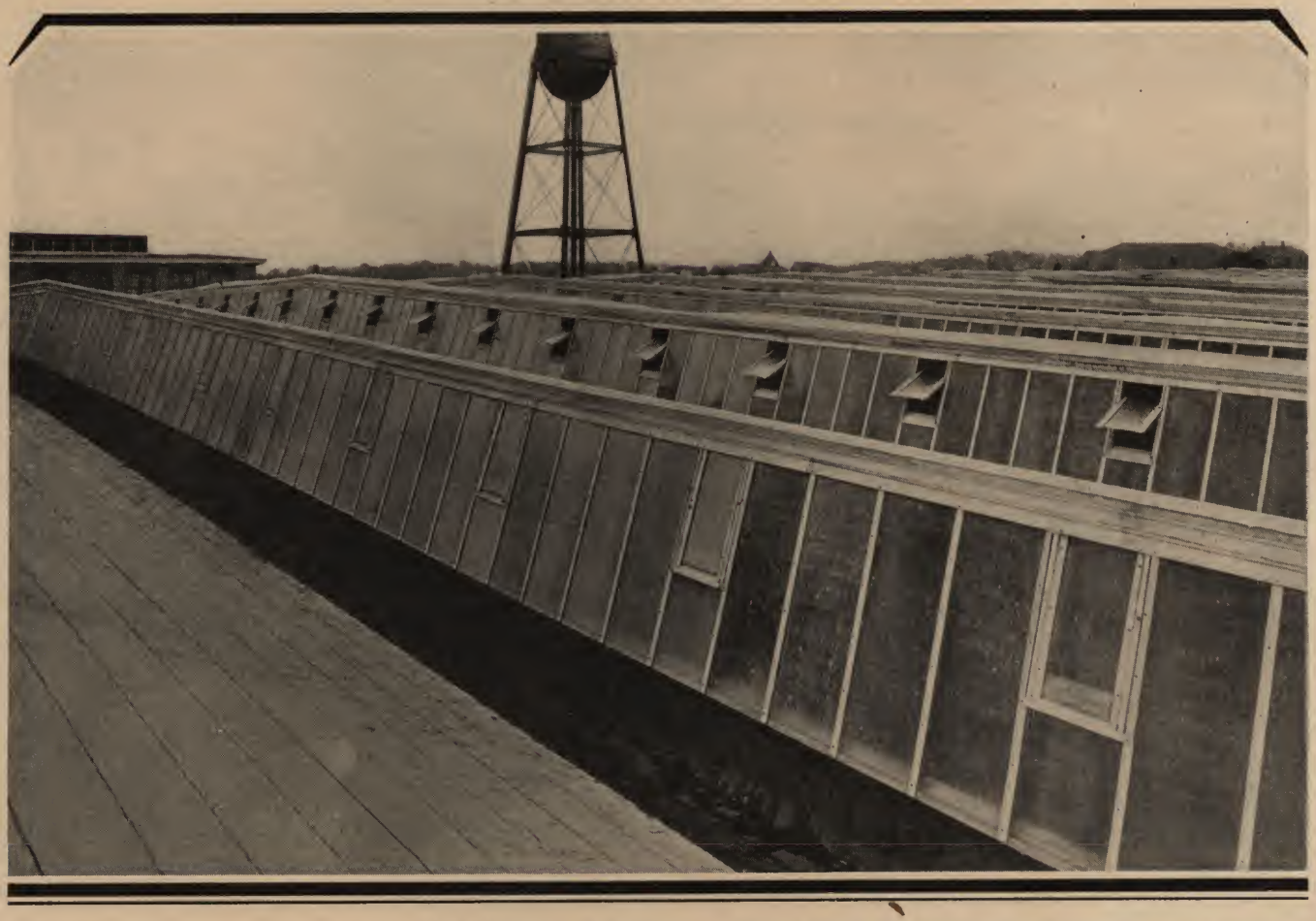
WOOD CURB: Special care should be taken by carpenters to see that wood studding and capping, Item I, are adequately secured to prevent lifting by high winds. These wood parts should be of good quality, well-seasoned new spruce or yellow pine, or common grade of red or white oak.

Tongued and grooved sheathing, rather than open joints should be used for greater strength, fire-resistance, and protection against high winds.

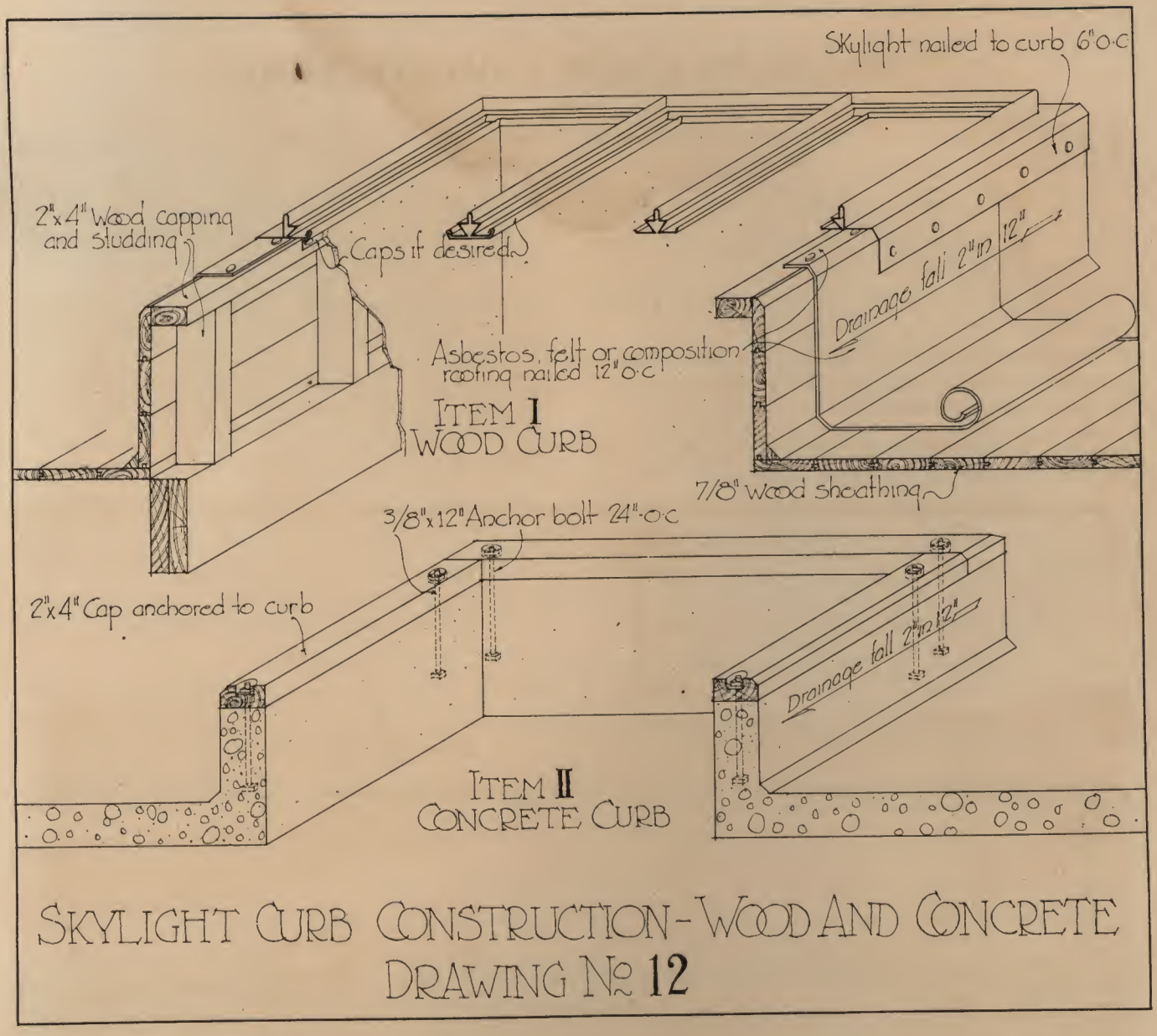
Securing Skylight: After roofing material is brought up side of curb and nailed 12″ o.c., skylight is put in place and edges nailed 6″ o.c. entirely around curb.

CONCRETE CURB: A mixture at least as dense as 1-2-4 (cement-sand-gravel, respectively), and preferably 1-1½-3, should be used for skylight curb construction.

In a 4-inch concrete curb, ⅜″ or ½″ anchor bolts at least 12″ long, as shown in Item II, should be placed at intervals not to exceed 24″. Too much stress cannot be laid on this important feature of adequate re-inforcement of the concrete and security for the wood capping. Heads of anchor bolts should be counter-sunk for a flush surface.



All bars and frames on this saw-tooth skylight roof of the Duncan Weave Shed, Greenville, South Carolina, are made of rust-resisting ARMCO Ingot Iron.



SKYLIGHT CURB CONSTRUCTION - WOOD AND CONCRETE
DRAWING No. 12

Securing Skylight: Information given for "Wood Curb" applies equally here.

GALVANIZED IRON CURB: The elevation views in Drawings Nos. 13 and 14, and many of the examples in Drawing No. 15, have sheet metal curbs as a part of the skylight frame. The edges of these are turned out not less than 4" and embedded between plys of roofing paper or otherwise flashed or joined with roofing material in approved manner.

Securing Skylight: Flanged edge of skylight should be nailed or otherwise secured to roof deck, 12" o.c.

Sealed Skylight Construction

DRAWING No. 13 details the construction of this type of skylight.

CURB BAR: The Z formation of this type of skylight bar shown in Item II, provides the necessary supporting strength, and with the lower edge turned up slightly, it prevents dripping of water formed on under side of the pane by condensation.

Putty placed where indicated prevents water from running under panes, and provides a cushion for the pane to rest on.

In lieu of putty hair felt as shown in Item VI can be placed above and below glass.

Note in Item II that the top edge of curb bar is turned outward and down forming a double edge, continuing down and then out to form the curb, just as shown for side bar—Item IV. Weeper tubes pass through both thicknesses of metal.

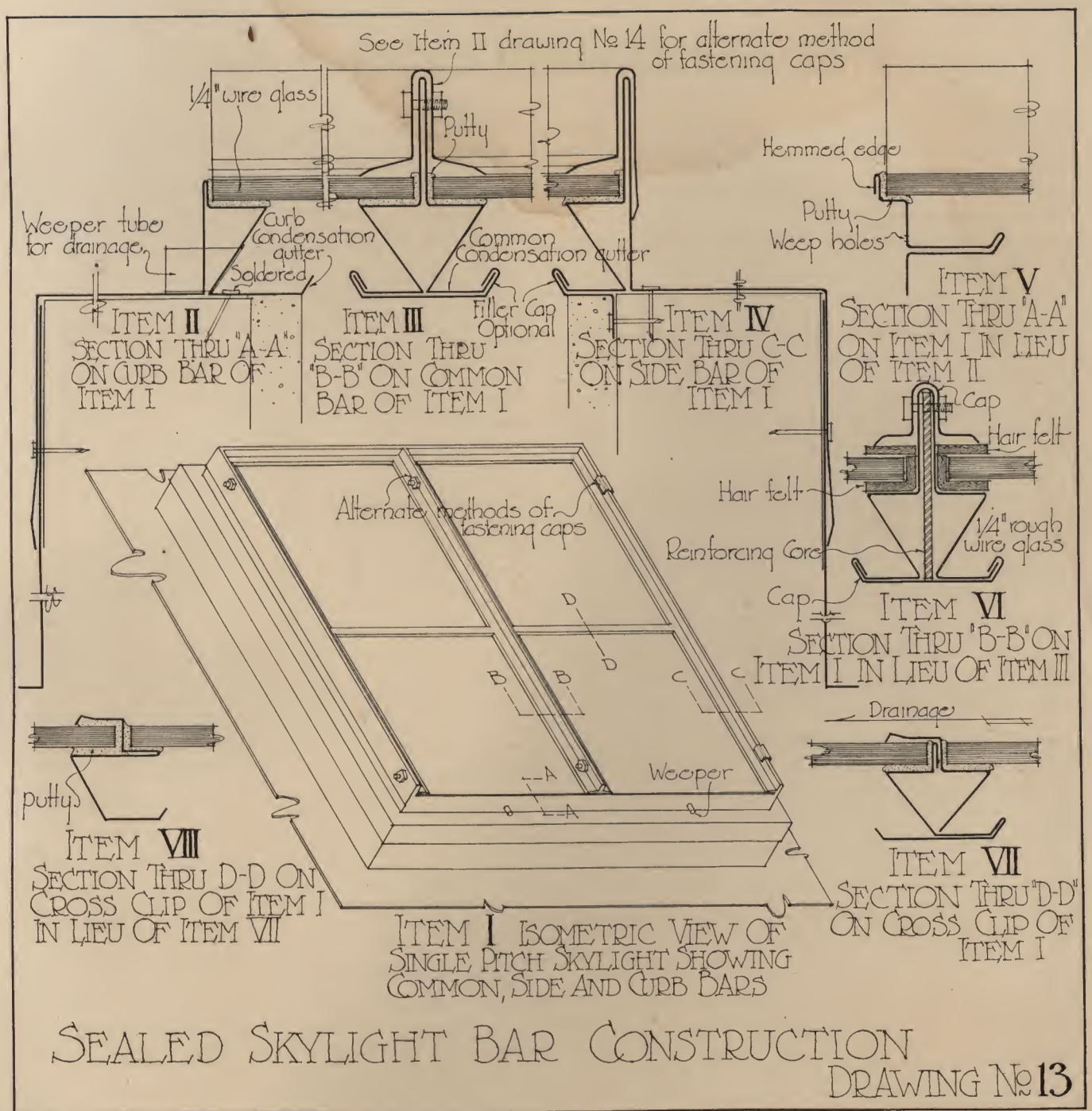
Item V details an alternate method that allows condensation to drain through a weeper hole instead of a tube, and diverts drainage from the sheet metal curb. The "hemmed" edge adds strength to this particular type of construction while the general form conserves material.

COMMON BAR: The same principle of formation is carried out here, Item III, except that the double Z formation provides support and drainage for two pane edges. When placed at right angles to the curb bar, note that condensation from both bar gutters drains directly into the curb bar gutter and thence out through the weeper. The filler cap adds some strength but it is chiefly used for the finished appearance it adds, and to hold the reinforcing core when one is required.

SECURING CAP: In lieu of the bolt method shown in Items III and VI, ½″ wide lugs may be inserted through the top of web or bar formation. These are turned upward and projected through vents cut in top of capping and then turned downward, thus firmly securing the cap. Drawing No. 14, Item II, shows this method.

There should always be at least two lugs or bolts in each side, common, and top bar, and they should not be more than 36″ apart. In event of broken

Forty thousands pounds of ARMCO Ingot Iron used in construction of these double pitched skylights on the Vogt Manufacturing Company Building at Rochester, N. Y. Architect—G. Morton Wolfe.



panes, they can easily be replaced by releasing fastenings and lifting caps.

SIDE BAR: Construction of the bar is exactly the same here, Item IV, except that the outward shoulder is eliminated—the sheet forming the main skylight curb and flashing edge instead. The same is true of the capping; the lower ½″ of the outside edge is crimped to stiffen it.

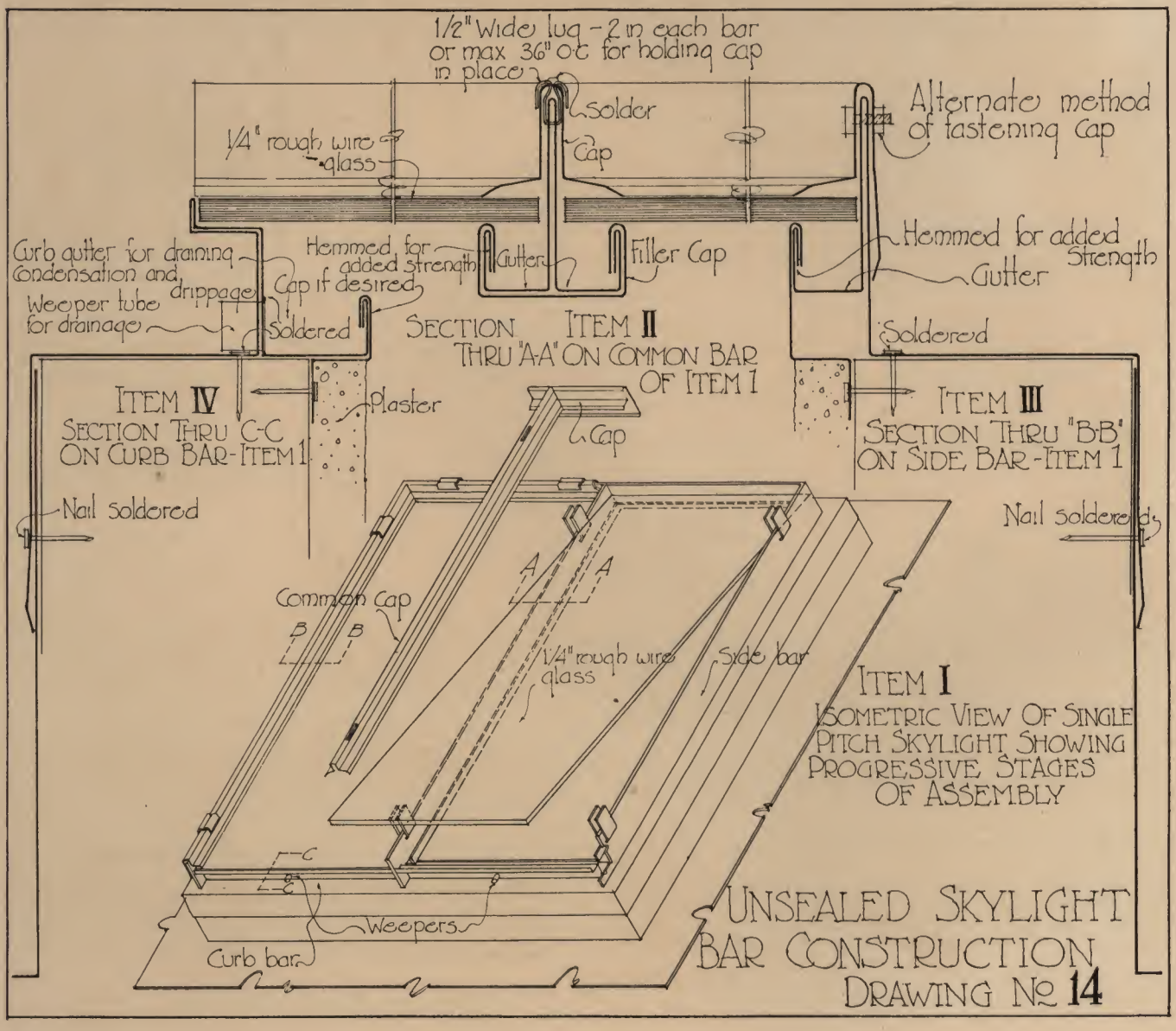
Top bars are same as side bars.

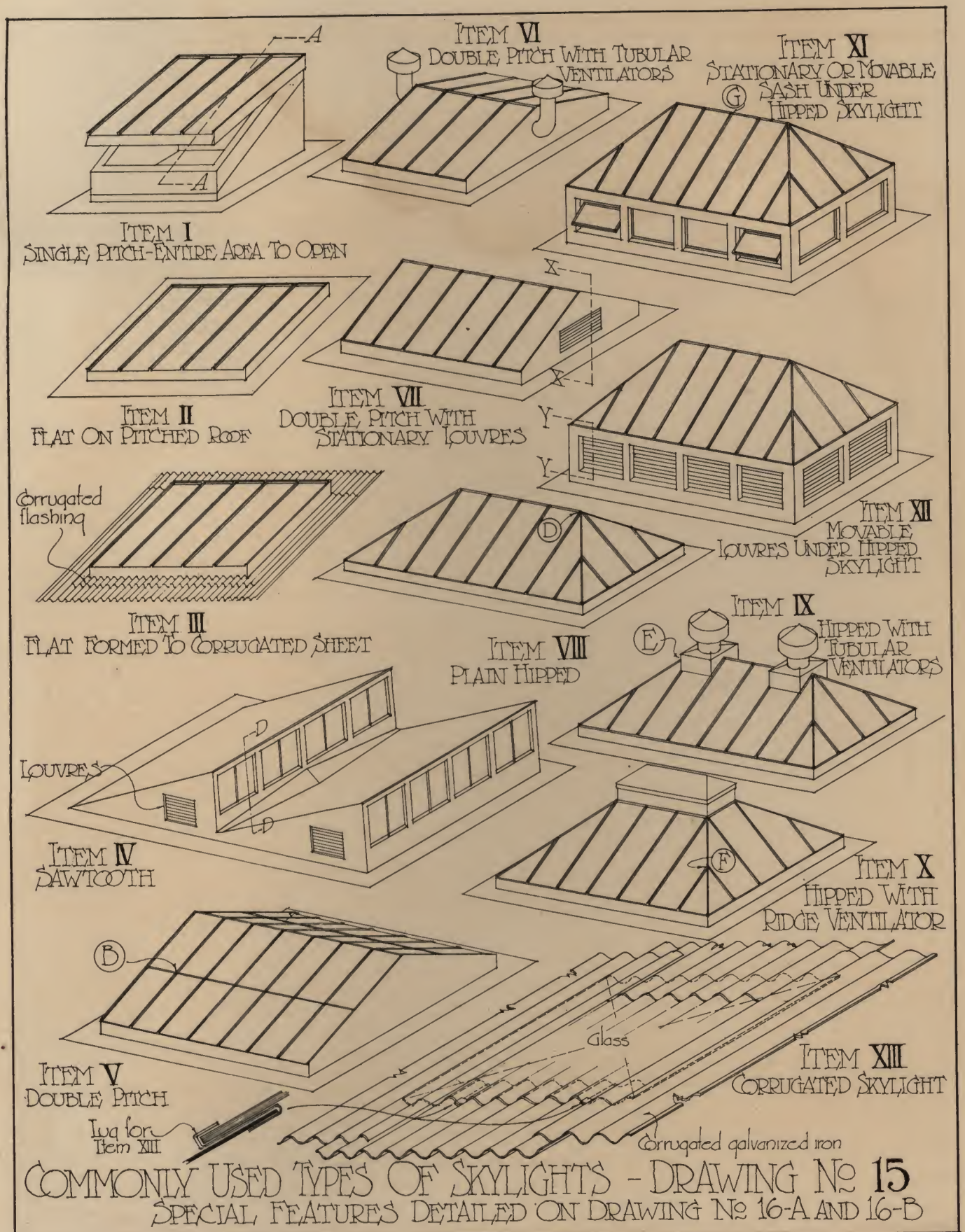
Unsealed Skylight Construction

THIS type of skylight has the advantage in case of necessity for replacing panes, that unskilled hands can do it, and this much more quickly than when putty is used.

Drawing No. 14 details the method of construction.

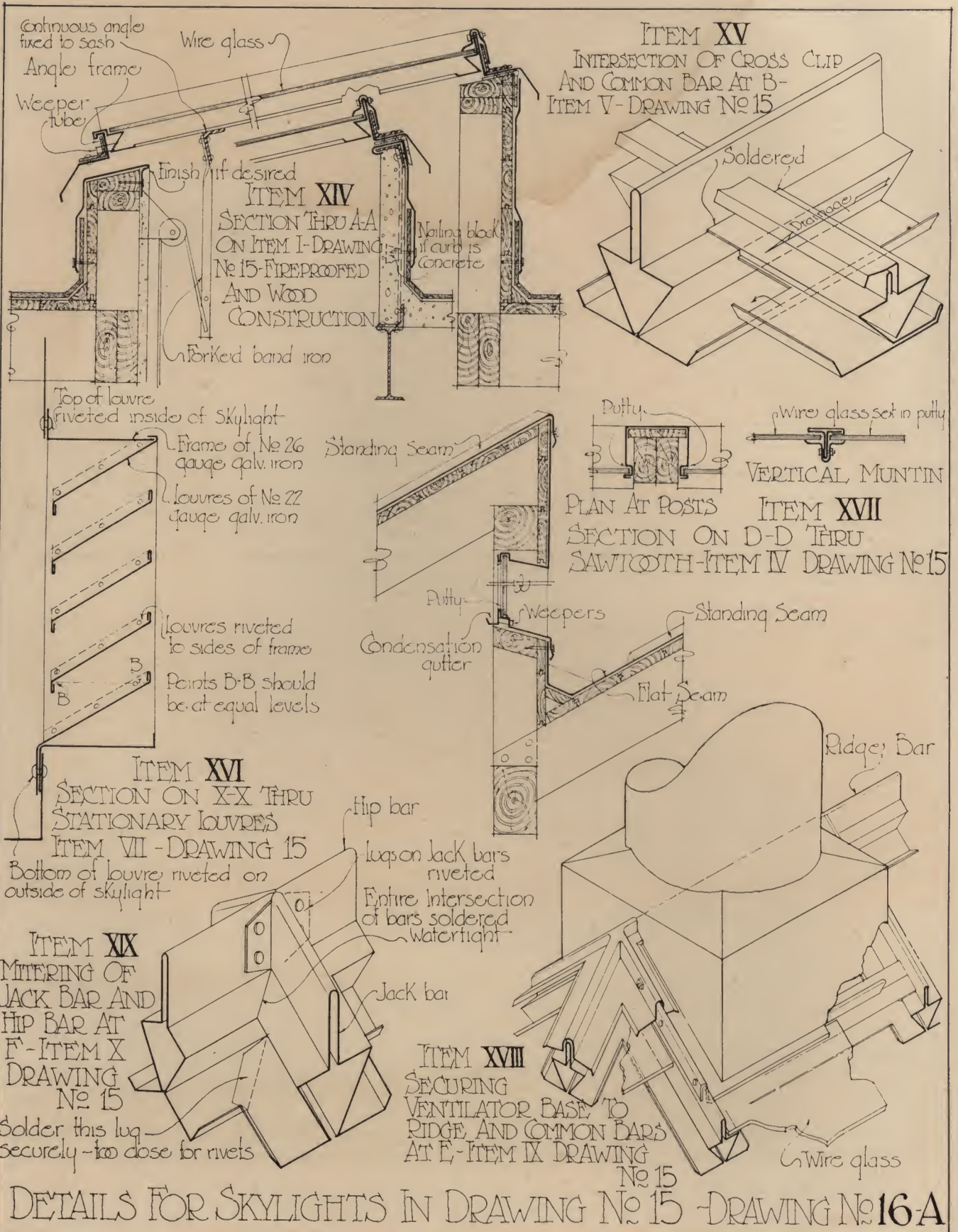
CURB BAR: The construction of bar and capping in this type of unsealed skylight is very similar to that shown in Drawing No. 13 for sealed construction, except that gutters are larger to accommodate drainage of water that leaks in under caps, as well as condensation from the under side.



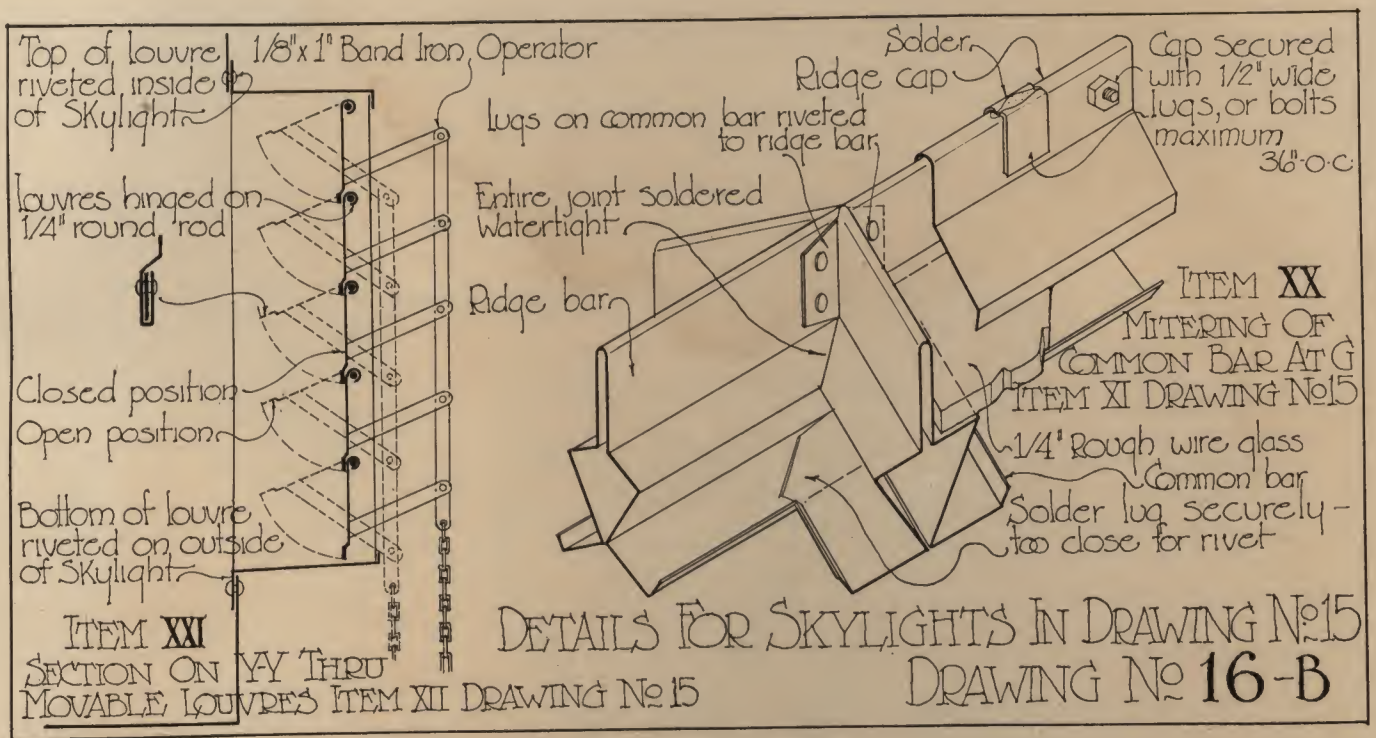


COMMONLY USED TYPES OF SKYLIGHTS - DRAWING No. 15

SPECIAL FEATURES DETAILED ON DRAWING No. 16-A AND 16-B

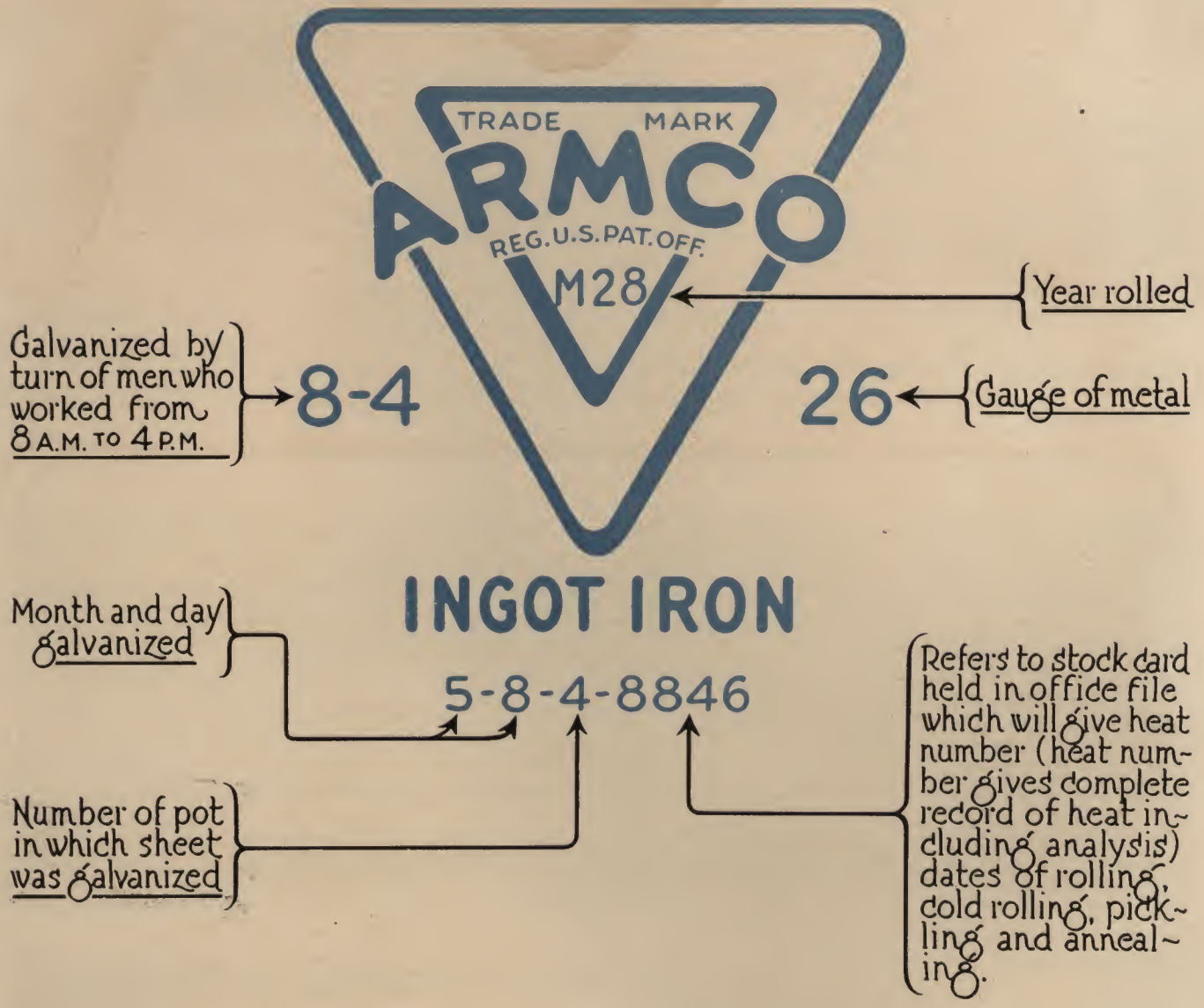


DETAILS FOR SKYLIGHTS IN DRAWING № 15 -DRAWING № 16-A



Skylight frames on this Manchester Terminal Corporation Building, Houston, Texas, are of 26 gauge ARMCO Ingot Iron. Architect and Engineer—R. J. Cummings.

Protection Against Substitution



This is the trade mark of ARMCO Ingot Iron, the purest iron made. Every sheet of pure iron is marked with the blue triangle. On jobs where rust-resisting ARMCO Ingot Iron of a definite gauge is specified, care should be taken to guard against substitution of inferior grades or lighter gauges. The gauge is shown at the right of the triangle.

All ARMCO Ingot Iron sheet metal work should bear at least a portion of the triangle trade mark shown above, for it is placed at intervals diagonally across the sheet. If ARMCO Ingot Iron is specified and the triangle is not in evidence, either inside or outside, it is an indication that the specifications have not been fulfilled.

Specification Suggestions for Galvanized Iron Cornices, Marquises, and Skylights

Note to Architect: The following specification suggestions are arranged in four sections—first, a general section applying to all types of galvanized iron cornices, marquises, and skylights; second, a section on cornices; third, a section on marquises; and fourth, a section on skylights.

The first section can be used as the prefix to any of the other three parts.

Because of the great variety of cornices, marquises, and skylights, the specification sections for these parts may not cover all the desired points in each specific case. But we believe the suggestions these sections offer will be helpful in preparing specifications for any type of such building parts.

For a short form specification to eliminate excessive detail and copy, we would suggest the one given at the end of the general specification, page 47.

Section A—General Information

Preliminary Matters

1. WORK INCLUDED: Where shown or indicated on the contract drawing or drawings, and in the following specifications, and between the limits there indicated, the sheet metal contractor shall furnish and erect all sheet metal work of the profile shown. He shall also furnish and apply such other materials as are specifically called for elsewhere in these specifications.

The contractor shall do all cutting, forming, fitting, and securing of his work, that may be required by such drawings and specifications, and shall fit it to receive or be received by work of other contractors shown upon, or reasonably implied by the drawings and specifications for the completed structure.

2. VARIATION: No variation whatever in quality of materials or workmanship, or methods of construction or erection, from approved drawings and specifications, will be permitted unless such variations receive the architect's approval. Any un-approved variations or substitutions will not be adjustable save by removal and replacement according to specifications and drawings.

3. CLEANING UP: The sheet metal contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his employees or work, and at the completion of the work he shall remove all his rubbish from and about the building, and all his tools, scaffolding, and surplus materials.

4. DRAWINGS AND SCHEDULES: The sheet metal contractor shall (a) *carry out the execution of his work according to the details and instructions indicated on drawings furnished by the architect, or shall submit a detailed sketch and obtain the architect's approval before carrying out any variation from the architect's drawings and specifications*—(b) *submit to the architect and obtain his approval of shop drawings in duplicate, showing in complete detail, the construction and erection of his work.*

A schedule and detail of all necessary connections, bolts, lag-screws, and the like, for fastening the sheet metal parts to supporting structure, shall be submitted by sheet metal contractor to architect, and after approval by architect, shall be given to each of the contractors that must make provision for such connections and attachments.

All such connecting items shall be furnished by the sheet metal contractor.

5. INSPECTION OF SUPPORTING STRUCTURE: To insure the proper execution of his subsequent work, the sheet metal contractor shall measure and inspect work already in place, upon which proper execution of his work depends, and shall report to the architect at once, any discrepancy between the executed work and the drawings.

Failure to do this shall be no excuse for improper construction and erection of the sheet metal contractor's work.

Materials

6. GALVANIZED IRON: All sheet metal work indicated on drawings and later noted in these specifications, shall be of galvanized ARMCO Ingot Iron of specified standard gauge—manufacturer's brand and gauge number to show plainly on each formed part.

7. RIVETS, NAILS, AND BOLTS: All rivets shall be galvanized or tinned iron; nails shall be full barbed galvanized iron, and bolts shall be galvanized iron.

8. SOLDER: All solder shall be composed of approximately 50% tin and 50% lead, both virgin metals, and shall be free from antimony.

9. MATERIALS IN CONTACT: Copper, brass, or other corrosion-inducing materials, shall not be placed in direct contact with galvanized iron.

Workmanship and Inspection

10. DETAILS: Except where otherwise called for or indicated on drawings, the various sheet metal parts shall be constructed and applied as detailed in "Handbook on Galvanized Iron for Cornices, Marquises, and Skylights," 1928 edition, by The American Rolling Mill Company, Middletown, Ohio.

11. PROFILE AND SURFACE: Sheet metal parts shall be formed true at every point to the profile shown. All members shall run absolutely level or to the indicated slope. All formed corners, edges, and intersections shall be straight and at all points true to the accepted profile. All exposed parts shall be free from buckles, waves, sags, bends, hammer marks, broken galvanizing, smeared solder, or other blemishes.

12. GALVANIZED COATING: Care shall be taken to avoid breaking or unnecessarily marring the galvanized coating while forming and applying the galvanized iron sheets.

13. JOINTS: Joints and seams shall be so formed as not to hold water either as a cup or by capillary attraction, and shall be watertight. Exposed nail, rivet, or bolt heads, occurring on draining surfaces, shall be neatly soldered watertight. Exposed part of sheets to be joined must be in tight contact at every point along the joint before soldering is commenced.

Except in circular work, no dependence shall be placed on solder to strengthen a joint.

Pocket seams, clinched edges, and notches, which will prevent seams, joints, miters, and the like from giving away when subjected to the heat of fire, or the stresses of expansion and contraction, are acceptable in lieu of riveting.

All mitres shall be so formed by cutting along, that the joint lies entirely in the plane determined by the intersection of the members joined. All miters shall be true, strong, and tight-jointed before soldering watertight.

14. RIVETING, NAILING, BOLTING, ETC.: All riveting, nailing, bolting, or other similar methods of fastening shall be done neatly, securely, and without spalling the galvanized coating outside the fastener head, or noticeably buckling, depressing, or bumping the sheet metal.

15. SOLDERING: Sufficient solder shall be used, and so well and smoothly flowed over seams, joints, and attachment heads on draining surfaces, as to make a completely watertight job in the service for which the part is intended, and the solder shall not be noticeably visible from the point of common vision after the part is installed.

16. SHOP INSPECTION: Before paint is applied, the sheet metal contractor shall notify the architect, of the completion of the shop work, so that inspection can be made if the architect deems it necessary.

17. PAINTING: All surfaces of all sheet metal parts shall be given one good coat of approved priming paint for galvanized iron, after these parts are thoroughly clean and dry, and before they are erected on the job. Oil, grease, finger marks, etc., may be removed with gasoline.

Section B—Galvanized Iron Cornice

18. GAUGE: All sheet metal used in construction and erection of this cornice body, shall be of (a) *26*; (b) *24*; (c) *22* gauge galvanized ARMCO Ingot Iron.

19. SURFACE: All exposed surfaces of main cornice body shall be deeply crimped, 3/16″ c.c. crimps, running either vertically or at right angles to the wall face.

Note to Architect: This may be modified to include only the larger flat surfaces when depth and relief from monotonous flatness is needed.

Supporting Structure

Note to Architect: If possible, it is most satisfactory to have supporting structure included in sheet metal contractor's specifications, thus giving him opportunity to properly secure his work. And by thus centralizing responsibility for the entire job, it is most convenient.

However, if this is not possible, articles 20, 21, 22, and 23 should be eliminated from sheet metal contractor's specifications, and included in specifications for other trades.

20. GENERAL: Lookouts and other supports must have a sufficient combined strength and security to support a load of forty pounds per square foot of projected horizontal area of cornice or balustrade, plus a concentrated load of 500 pounds on the extreme outermost portion of each; and to maintain accurate alignment vertically and longitudinally.

Lookouts and other similar supports shall be so approximate to the form shown on cross-section of cornice, as to permit of connecting bands at not less than three places, but no part of any lookout shall come closer than ½″ to the body sheet of the cornice.

Lookouts shall be accurately aligned both vertically and longitudinally and evenly spaced 2′ o.c. between ends of cornice or of pilasters or brackets which are of such size as to require a pronounced change in the profile of the cornice.

21. METAL LOOKOUTS AND BANDS: All such lookouts shall be made of structural grade, open hearth steel angles or shapes. No connection shall contain less than two rivets or bolts in each connecting member, and where necessary to proper security, gusset plates shall be used.

Bands for stiffening of cornice shall be of iron of not less than 1¼″ x ¼″ section, formed accurately to the general profile of cornice and painted thoroughly all over with two good coats of approved paint. One such band shall be attached to each lookout in not less than three places by not less than two rivets or bolts at each place of attachment.

One such band shall also be placed within two inches of each heel of a mitered joint and under or closely adjacent to each transverse joint.

22. PAINTING METAL SUPPORTING STRUCTURE: All metal lookouts, supports, and band iron braces shall be painted all over with two coats of paint before being assembled to other work or before being erected.

23. WOOD LOOKOUTS: All such lookouts shall be of good quality, well-seasoned, new spruce or yellow pine, or common grade of red or white oak.

Joints and Seams

(See Section A, Articles 13, 14, 15, of this spec.)

Note to Architect: Articles 25 and 26 do not apply in their entirety to curved cornices. Consult the details and accompanying text on curved cornices, pages 24 and 25, for information to prepare these articles.

24. TRANSVERSE SEAMS: All such shop and field seams and joints shall be made over a band or be otherwise rigidly supported in an approved manner. Except where lock-seamed with cleats, joining sheets shall be lapped at least 1¼″, fastened with rivets spaced not over ⅝″ from edge of each joining sheet, and not more than 3″ o.c. along the seam.

Transverse field joints on cornice deck shall be flat-locked, cleated—two cleats to a sheet width, and soldered watertight. Locks shall be turned in direction of flow.

Note to Architect: If the cornice is so small as not to require deck sheathing, last paragraph of No. 24 can be omitted.

25. LONGITUDINAL SHOP JOINTS: All longitudinal shop joints (except in circular work) should be locked together with an approved lock seam in which each of the sheets is turned not more than 180 degrees. If either sheet turn through less in the joint, the joined sheets shall be secured with rivets spaced not over 3″ o.c. All longitudinal shop joints, whether riveted or not, are to be soldered to prevent entrance of water.

26. LONGITUDINAL FIELD JOINTS: All longitudinal field joints in the cornice body shall be made on a vertical cornice body member or at the intersection of such a member with a horizontal member. Such joints should be avoided on cornice deck, if possible, but when necessary, shall be cleated, flat-locked, and soldered watertight, with lock turned in direction of flow.

Note to Architect: Last part of Article No. 26, ". . . but when necessary," etc., should be omitted if cornice is so small as not to require deck sheathing.

27. ATTACHING ORNAMENTS: All ornaments including brackets, shall be (a) *attached with rivets spaced not over 3 o.c.*—(b) *lock-seamed*—(c) *clinched* (or otherwise attached in approved manner). All joints shall be soldered watertight. Each ornament shall be attached by at least three rivets.

All surfaces of all closed pockets back of ornaments shall be thoroughly coated with one good coat of paint before ornaments are attached.

All cornice members shall continue as uninterrupted sheets behind all discontinuous ornaments, and behind all continuous ornaments made of zinc.

28. FIRE STOPS: At each fire wall, or at 20′ intervals when the line of fire wall does not intersect with the face of building, a fire stop of (a) *26*—(b) *24*—(c) *22* gauge ARMCO Ingot Iron shall be furnished and erected by the sheet metal contractor.

Securing Cornice

Note to Architect: Article No. 30 will have to be revised slightly for curved cornices. Consult details and text, pages 24 and 25.

29. SECURING TO LOOKOUTS AND BRACES: Each cornice member shall be attached to each band iron brace by rivets or bolts inserted from outside and spaced not over 3″ o.c. with not less than one rivet in each cornice member.

30. WATERPROOFING DECK JOINT AT MASONRY WALL: Edge of roof deck sheet shall be turned up on wall facing at least 6″ and (a) *be turned 1½″ into raked-out masonry joint previously filled with cement*—(b) *be caught under counter-flashing strip, and held securely to wall by aproved masonry nails or other fasteners, at intervals of 1′4″ o.c. Cap flashing strip in such case shall be turned 1½″ into masonry wall and secured by coiled metal wedges at intervals of 12″ o.c., shall lap at least 4″ over base flashing, and shall have an additional ½″ crimp at lower edge.*

Drainage

Note to Architect: Article No. 33 should be omitted if a gutter is not included in the drainage plan.

31. CORNICE DECK: Cornice deck shall have a continuous fall to drainage point of at least ¼″ in 1′.

32. DRIPS: A drip joint turned down to a 45 degree angle, shall be formed where the deck sheet joins with cornice body sheet.

Note to Architect: If deck drains to a gutter, or if cornice is so small as not to require a separate sheet, Article No. 32 should be omitted.

However, other drips should be provided by undercuts in the design of profile at, or as close as possible to, the edge of all surfaces upon which dust can lie. Also, such a formed drip should be required where the bottom of cornice joins wall face.

33. GUTTERS: Gutter lining shall have a continuous fall to drainage points, of not less than 1/16″ in 1′.

Drainage outlets shall be provided at intervals not to exceed 40′.

Runs of more than 50′ shall be broken by butting closed end sections together and connecting them with a metal saddle.

Transverse shop joints shall be riveted not less than 3″ o.c.; transverse field joints shall be cleated and flat-locked, and all joints as well as rivet heads, shall be soldered watertight. Locks and laps shall be in direction of flow.

No longitudinal joints shall be permitted in gutter lining.

Supporting structure shall provide a continuous bed for gutter lining, and shall have sufficient strength to support a load of 40 pounds per square foot.

Section C—Marquises

Note to Architect: Practically all the points that can be covered in a general marquise specification, are included in Sections A, B, and D of this specification.

For this reason, and the fact that marquises differ so widely in other points of construction and erection, no attempt is made here to offer a marquise specification.

Reference to the parts of Sections A, B, and D, and the drawings and text in the marquise detail section, pages 26 to 32, will serve in the preparation of a specification applying to the particular type of marquise to be built.

Section D—Skylights

General

34. WORK INCLUDED: Sheet metal contractor shall furnish all galvanized iron, glass, attachments, and other materials required for the construction and erection of the skylights indicated on contract drawings; and shall construct and erect these skylights according to details given on the drawings.

35. GAUGE OF IRON: All sheet metal shall be of__gauge galvanized ARMCO Ingot Iron.

Note to Architect: If core plates are necessary to strengthen skylight bars, they should be ⅛″ x 2″ structural iron, and if structural steel frame is required, members should be of structural grade, open hearth iron.

36. TYPE OF CONSTRUCTION: Skylight bar construction shall provide for leakproof drainage of precipitation from the outside and condensation from inside, by means of construction that is (a) *sealed with putty*—(b) *sealed with hair felt*—(c) *unsealed*, as indicated on drawings.

37. DRAINAGE: Weepers, ¼″ in diameter, shall be provided in curb bars for condensation drainage—one hole to a pane. All draining surfaces shall have a minimum fall of_____to drainage points.

38. SECURING CAPS: Caps shall be secured to skylight bars at intervals not to exceed 3′ o.c. and with at least two attachments to each pane, by (a) *bolts inserted entirely through tops of bar and cap after latter has been put in place*—(b) *½″ galvanized iron lugs inserted horizontally through top of bar, turned upward and projected vertically through top of cap, then turned downward on each side of cap*—(c) *T-bolts projected upward through top of bars and then secured with bolts after cap is put in place.*

Short Form Specification

Details of construction and erection shall be done according to detail drawings and all possible applicable parts of section A and (a) *section B*—(b) *section C*—(c) *section D* of Specification Suggestions of The American Rolling Mill Company in their "Handbook on Galvanized Iron for Cornices, Marquises, and Skylights," 1928 edition.

All sheet metal used in construction and erection of this (or these)—(a) *cornice*—(b) *marquise*—(c) *skylight* (or skylights), shall be of (a) *26*—(b) *24*—(c) *22* gauge galvanized ARMCO Ingot Iron.

Note to Architect: Article No. 20 of General Specification Suggestions should be included intact, modified, or eliminated entirely from this short form specification, as circumstances may require.

Specification Memoranda

Thickness, Weight, and Sizes of Galv. Sheets

THE density of rolled steel, .2833 lbs. per cubic inch, or 489.6 lbs. per cubic foot, has been adopted by the Association of American Steel Manufacturers, and The American Society for Testing Materials, and has been approved by The Bureau of Standards. Thickness in the following table are of steel, equivalent to the unit weights of the U. S. Standard Gauge.

Because uneven gauges are rarely used in galvanized iron construction work, only even gauges are shown.

Number of Gauge	Approximate Thickness in Decimal Parts of an Inch	Weight Per Square Foot in Pounds Galvanized
12	.1072	4.531
14	.0766	3.281
16	.0613	2.656
18	.0490	2.156
20	.0368	1.656
22	.0306	1.406
24	.0245	1.156
26	.0184	.906
28	.0153	.781

WEIGHT AND SIZES OF GALVANIZED IRON SHEETS

GAUGE	12	14	16	18	20	22	24	26	28
SIZE	Wt. Per Sheet	Wt. Per Sheet	Wt. Per Sheet	Wt. Per Sheet	Wt. Per Sheet	Wt. Per Sheet	Wt. Per Sheet	Wt. Per Sheet	Wt. Per Sheet
24 x 72	54.37	39.37	31.87	25.87	19.87	16.87	13.87	10.87	9.37
26 x 72	58.91	42.66	34.53	28.03	21.53	18.28	15.03	11.78	10.16
28 x 72	63.44	45.94	37.19	30.19	23.19	19.69	16.19	12.69	10.94
30 x 72	67.97	49.22	39.84	32.34	24.84	21.09	17.34	13.59	11.72
36 x 72	81.56	59.06	47.81	38.81	29.81	25.31	20.81	16.31	14.06
24 x 84	63.44	45.94	37.19	30.19	23.19	19.69	16.19	12.69	10.94
26 x 84	68.69	49.74	40.27	32.69	25.11	21.32	17.53	13.74	11.84
28 x 84	74.00	53.58	43.38	35.21	27.05	22.96	18.88	14.80	12.76
30 x 84	79.30	57.42	46.48	37.73	28.98	24.61	20.23	15.86	13.67
36 x 84	95.16	68.91	55.78	45.28	34.78	29.53	24.28	19.03	16.41
24 x 96	72.50	52.50	42.50	34.50	26.50	22.50	18.50	14.50	12.50
26 x 96	78.53	56.86	46.03	37.37	28.70	24.37	20.04	15.71	13.54
28 x 96	84.55	61.23	49.57	40.24	30.91	26.24	21.58	16.91	14.58
30 x 96	90.62	65.62	53.12	43.12	33.12	28.12	23.12	18.12	15.62
36 x 96	108.75	78.75	63.75	51.75	39.75	33.75	27.75	21.75	18.75
24 x 108	81.55	59.06	47.70	38.70	29.70	25.20	20.70	16.20	14.06
26 x 108	88.35	63.96	51.67	41.93	32.18	27.30	22.43	17.55	15.23
28 x 108	95.15	68.89	55.65	45.15	34.65	29.40	24.15	18.90	16.40
30 x 108	101.94	73.82	59.62	48.38	37.11	31.50	25.88	20.25	17.52
36 x 108	122.33	88.59	71.55	58.08	44.55	37.80	31.05	24.30	21.09
24 x 120	90.62	65.62	53.12	43.12	33.12	28.12	23.12	18.12	15.62
26 x 120	98.15	71.07	57.53	46.70	35.87	30.46	25.04	19.63	16.92
28 x 120	105.71	76.55	61.97	50.31	38.64	32.81	26.98	21.14	18.23
30 x 120	113.28	82.03	66.41	53.91	41.41	35.16	28.91	22.66	19.53
36 x 120	135.94	98.44	79.69	64.69	49.69	42.19	34.69	27.19	23.44


THIS TRADE MARK IN BLUE
IS PLAINLY STAMPED
ON EVERY GALVANIZED
ARMCO Ingot Iron SHEET
TRADE MARK
ARMCO
REG U.S. PAT. OFF.
M26
8-4 26 GAUGE
INGOT IRON
6-8-4-8346
This Blue Triangle appearing on the sheet metal built into your structures will assure a high quality pure iron
Properly Protected

Development and Service of ARMCO Ingot Iron

THE very importance of materials and the constantly growing appreciation of the substantial difference in the life of iron and steel under service conditions, make it necessary for every user of these products to inform himself on the correct way to describe and specify the particular metal his needs require.

In the earliest days of the iron industry, there was no such thing as commodity steel. What little steel was made was produced by the cementation process which added to the iron the necessary carbon to give it hardening properties for the making of weapons. The irons of that time were made by laborious hand processes. Modern commercial methods of iron and steel making were unknown.

The name iron had been carried into the steel business in such a way as to result in a great confusion of terms. For instance, "galvanized iron," which had formerly been applied to the puddled iron sheets, was applied to steel sheets as well. The name had remained the same, but the product was different. Both iron and steel sheets were coated with zinc (galvanized) and looked alike. The public made no distinction between them until forced to do so by the rapid rusting of steel sheets compared with the iron product.

The invention of ARMCO Ingot Iron—pure iron—was neither accidental nor unpremeditated. Economic necessity fostered, and scientific research assured its development. But the economic urge which finally led to its production came originally from farmers all over the country.

These farmers found that modern steel products were not giving the length of service they had secured from the iron of previous generations. They lodged their complaints with the United States Department of Agriculture. Finally, the problem became so important that the Department of Agriculture sought to solve the question: "What causes rust, and what can be done to curb the hasty deterioration of modern steel?"

Dr. A. S. Cushman, then associated with the United States Department of Public Roads, and later president of the Institute of Industrial Research in Washington, D. C., was chosen to conduct this investigation. His research experiments and contributions, substantiating the now commonly accepted electrolytic explanation of corrosion, have been published again and again in all parts of the world. A government pamphlet, No. 239, dealing with "The Corrosion of Fence Wire," published in 1905, was the result of these experiments. This pamphlet pointed out that purity is an essential factor in the life of iron and that impurities hasten corrosion.

Chemical Purity

To make pure iron, all the raw materials must be selected by chemical analysis—only the purest can be used. For this reason, The American Rolling Mill Company found it necessary to secure its own ore deposits, coal mines, and other mineral holdings. In producing its own pig iron ARMCO further safeguards the finished product. Scrap also must be analyzed, and coal chemically examined—in fact, all raw material entering the open-hearth furnace must be especially low in impurities.

The total impurity content, consisting of carbon, manganese, phosphorus, sulfur, silicon and copper must be less than one-sixth of one per cent in ARMCO Ingot Iron. A record of seven consecutive years shows how well this standard of purity has been maintained.

1st year 99.876 per cent Iron by Difference
2nd year 99.879 per cent Iron by Difference
3rd year 99.882 per cent Iron by Difference
4th year 99.872 per cent Iron by Difference
5th year 99.852 per cent Iron by Difference
6th year 99.867 per cent Iron by Difference
7th year 99.865 per cent Iron by Difference

Average 99.870 per cent Iron by Difference

These figures represent a production of well over 1,000,000 tons of pure iron. Moreover, they

show ARMCO Ingot Iron is the purest iron made. This is a conclusive guarantee of homogeneity, uniformity and general excellence.

Rust-Resistance

Scientific research has demonstrated that purity is a safeguard against rapid rusting of iron. Purity assures utmost resistance to rust. Obviously, steel cannot be highly refined because its physical structure demands the retention of certain of the commonly known impurities—carbon and manganese, for instance.

The electrolytic action that accompanies rust, or oxidation, duplicates that action which takes place in a simple electric battery. The segregated impurities common to semi-refined iron and steel supply, in the presence of moisture, all the elements necessary for battery action—a conducting fluid and positive and negative poles.

As in the case of the battery, current flows in impure metal from the positive poles to the negative poles. Destruction of the sheet or plate is inevitable. When battery action gets under way in impure metal it must disintegrate to failure. In this way it responds to the law of electrolytic decomposition, or corrosion.

Hence, to obtain the fullest measure of rust-resistance it is imperative that metal be consistently pure in physical structure. Impurities must be reduced to the lowest possible fractional percentages.

So it is that ARMCO Ingot Iron excels in purity and consequent resistance to rust. Being very pure iron as shown in the preceding table, sulfur, carbon, manganese and other impurity segregations are virtually eliminated. The wasting battery action is retarded. And the pure iron is sure to last longer.

Uniformity

Even when pure iron does rust, the action is uniformly distributed over the entire surface in the form of a tightly adherent oxide, which, paradoxical though it might seem, is itself a protection to the iron beneath.

Such uniformity, which is readily seen to be a decided asset, comes from unusually high standards of manufacture. From ore to finished product every precaution is taken to insure high quality—for careful processing in every department and stage of fabrication means virtual absence of those defects that are often so costly to users of steel sheets and plates.

Identifying Characteristics of Pure Iron

ARMCO Ingot Iron possesses definite chemical and physical characteristics which set it apart as different and distinctive from all other ferrous metals. Because of its method of manufacture and state of refinement, it is:

1. CHEMICALLY DIFFERENT: The purest iron made—no other sheet meets Ingot Iron's purity standard.

2. METALLURGICALLY DIFFERENT: Degasified, uniform, slagless. A microscopic examination reveals the characteristic ferrite pure iron, well annealed grain structure.

3. PHYSICALLY DIFFERENT: Soft, ductile, workable. Tensile strength of dead soft annealed material 38,000 pounds per square inch, elongation not less than 22% in 8 inches, yield-point not less than 50% of tensile strength.

4. WORKING TEMPERATURE DIFFERENT: Possesses the critical temperature range characteristic of pure iron. Rollers and forgers can classify ARMCO Ingot Iron by its behavior when worked within its critical temperature range—1562° F (850° C) to 1922° F (1050° C).

5. GREATER RESISTANCE TO SOLUBILITY IN MOLTEN ZINC: Research investigators can classify ARMCO Ingot Iron by its resistance to solubility in molten zinc.

Further substantiating this fifth point, attention is directed to the following remarks quoted from "Galvanizing and Tinning," by W. T. Flanders, pages 18 to 20 inclusive:

"The laws of physics teach us that an impure substance will go into solution more rapidly than a pure one, and we do not find exceptions when dissolving iron in zinc. The purer the iron the more slowly it goes into solution. This is the reason that the old-fashioned puddled iron lasted so much longer than the modern steel. Now that ingot iron is being commercially produced, it has been very easy to demonstrate this fact in a scientific manner.

"These statements are borne out and given additional weight by a comparison of galvanized ARMCO Iron sheets with galvanized mild open hearth steel sheets."

Because of these identifying characteristics ARMCO Ingot Iron is universally chosen as the standard of pure iron not only for industry, but by scientists for experimental purposes and intricate investigations.

Economy of Using Pure Iron

THERE are many factors entering into the actual cost per service year of any sheet metal work. Not only must we consider the original cost, but the service life of the material plays an important part; and it is with its extra durability that pure iron paves the way to long service life, coupled with a low cost per service year.

When these elements of cost are considered, ARMCO Ingot Iron will be found the most economical material that can be specified. For instance, on a typical 100′ cornice installation of 24″ projection and 30″ high, a sheet metal contractor's estimates were:

ARMCO Ingot Iron		Steel
$ 27.00	Sheet metal	$ 22.50
15.75	Other materials	15.75
275.25	Labor and overhead	275.25
$318.00	Total	$313.50
63.60	Office overhead 20%	62.70
$381.60	Total	$376.20
38.16	Profit	37.62
$419.76		$413.82
$420.00	Bid	$414.00

These bids show ARMCO Ingot Iron's fundamental economy. When it brings anything more than 1½% longer life, it puts money in the owner's pocket. This means that, should this steel cornice last 30 years, pure iron must last only 30 years and five months to begin paying handsome returns on the investment. When steel lasts 50 years, pure iron must last only eight months longer. In the face of this negligible requirement, pure iron has demonstrated its durability time and again by lasting 50% longer than steel. And remember, all additional life over 1½% is profit—money in the pockets of the owners.

NOTE: On any job, the workability of the material is always an important consideration. This quality is especially essential to best results in forming sheet metal to intricate designs, such as for cornices, marquises, and the like.

Workability affects cost.

On large jobs involving considerable sheet metal forming work, contractors have learned that pure iron sheets, because of the uniformity and greater ductility of iron, have saved much of the difference in price over ordinary galvanized sheet metal. And workmen like to use it.

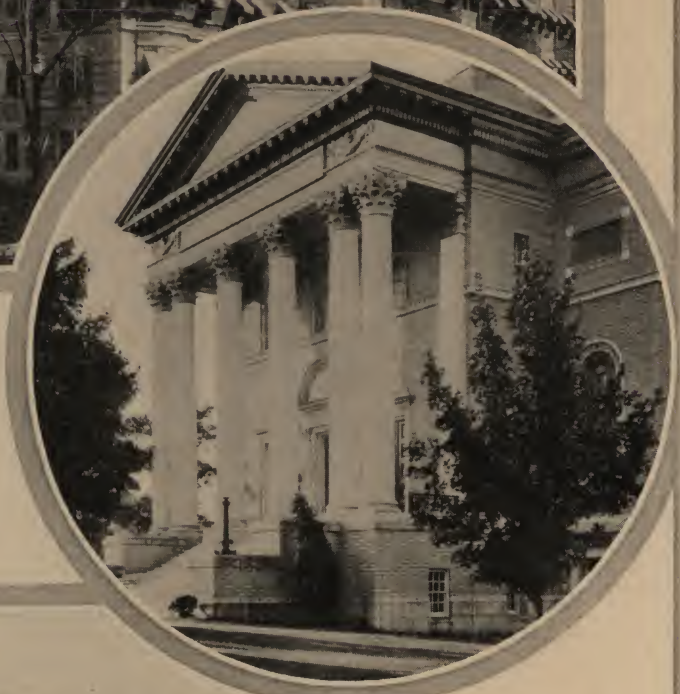
So, pure iron saves in other ways besides its low cost per service year.

St. Johns Hospital, St. Louis, Mo. ARMCO Ingot Iron cornice installed 1910. Architects: Barnett, Hayes and Barnett.

Belvedere Apartment, Cincinnati, Ohio. ARMCO Ingot Iron cornice installed 1926. Architect: C. H. Ferber.

Baker Hotel, Dallas, Texas. One thousand feet of galvanized pure iron cornice installed 1925. Architect: Preston J. Bradshaw, St. Louis, Mo.

Park Lane Villa Apartment Building, Cleveland, Ohio. ARMCO Ingot Iron cornice installed in 1923. Architect: Reynold H. Hinsdale.



First Church of Christ Scientist, Atlanta, Ga. ARMCO Ingot Iron cornice installed 1913. Architects: Arthur Neal Robinson, and Emmet Dougherty.

Branch bank of Union Trust Co., Cincinnati, Ohio. ARMCO Ingot Iron cornice installed 1915.

California Commercial Union Building, San Francisco, California. Cornice of Ingot Iron installed in 1922. Architect: George Kelham.

City Club, St. Louis, Mo. ARMCO Ingot Iron cornice, installed 1923, was designed by Architects, T. P. Barnett Company.

Third National Bank Building, Dayton, Ohio. ARMCO Ingot Iron cornice, installed in 1926. Schenck & Williams, Architects.

What better evidence that durable galvanized iron is being used for the pretentious as well as the more modest types of new buildings?

Tivoli Theater Marquise, Mishawaka, Indiana—constructed of 26 gauge ARMCO Ingot Iron.

Memorial Building, Wichita. Kansas. ARMCO Ingot Iron marquise installed 1925. Architect: S. S. Voight.

Hotel Lubbock, Lubboch, Texas. ARMCO Ingot Iron marquise installed 1927.

Palace Theater Building, South Bend, Indiana. ARMCO Ingot Iron marquise installed 1922.

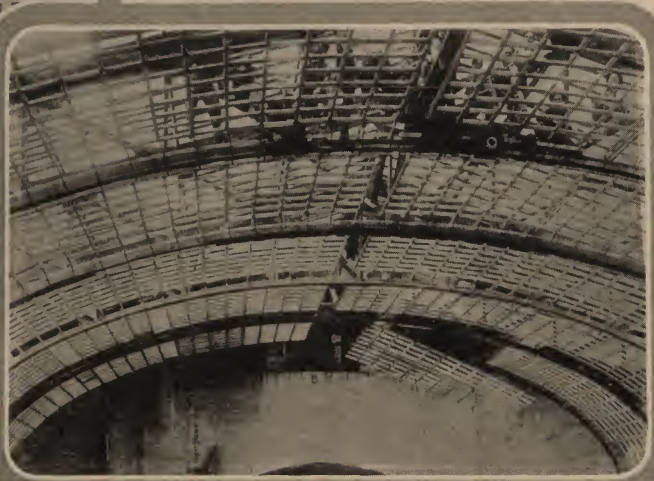
French Lick Springs Hotel, French Lick, Indiana. ARMCO Ingot Iron marquise installed 1910. Architect: D. A. Bohlen.

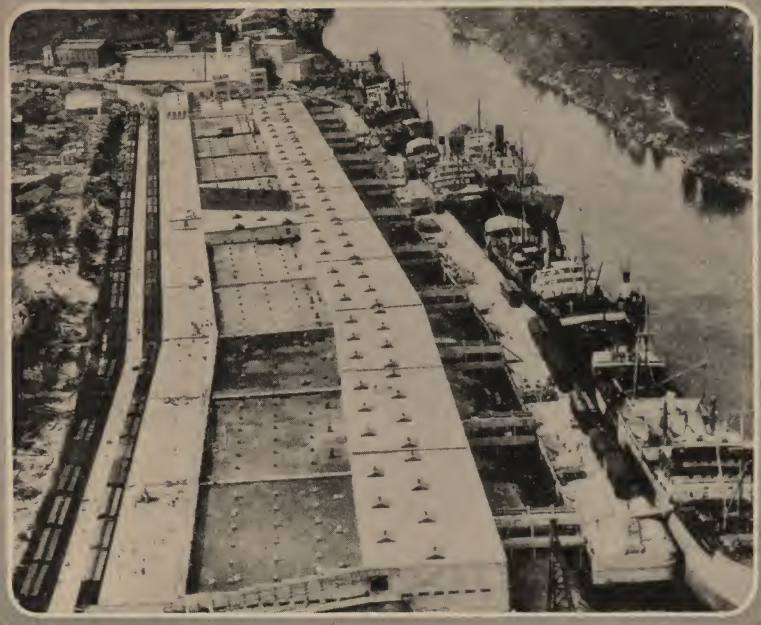
Store and Apartment, San Francisco, California. ARMCO Ingot Iron marquise installed 1925. Architect: Charles E. Rogers.

Corcoran Gallery of Art, Washington, D. C.—close view of skylight arrangement. Almost entire roof covered with ARMCO Ingot Iron skylights installed 1927. Architect: Charles A. Platt.

Utah State Capitol, Salt Lake City, Utah. ARMCO Ingot Iron skylights installed 1916. Architect: Richard R. Kletting.

Hibernia Bank Building, New Orleans, La. ARMCO Ingot Iron skylights installed 1921. Architect: Favrot & Livaudias.





Candler Warehouse & Cotton Compress Co., Atlanta, Ga. ARMCO Ingot Iron skylight installed 1915 and 1916. Engineer of Construction: Arthur Tufts.

Anderson-Clayton Cotton Warehouse, Houston, Texas. ARMCO Ingot Iron skylights installed in 1923. Engineer: R. J. Cummings.

J. A. Fay & Egan Company, Oakley, Cincinnati, O. ARMCO Ingot Iron skylights installed in 1919. Architects: Zettle & Rapp.

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Let us help solve your sheet metal problems

The ARMCO organization maintains a Sheet Metal Service Bureau whose services are available to architects, engineers, and others interested in the best use of sheet metal.

Twenty years' experience of the world's largest exclusive manufacturers of special analysis iron and steel sheets, plus the experiences of recognized competent workers in sheet metal, are at your disposal through this bureau.

Without charge or obligation they will gladly assist in working out your problems in the construction, erection, or fabrication of galvanized, black, or blue annealed sheets or plates.

Suggestions Invited

We shall appreciate any suggestions you may have that will help make this handbook or our services in general more helpful to architects, engineers, and others interested in lasting iron for building construction.

Roofing and Drainage Handbook

A companion book to this one, entitled "Galvanized Iron for Roofs and Roof Drainage," contains detail drawings and data and specification suggestions for various types of galvanized iron roofs and roof drainage parts of commercial, public, residential, and industrial types of buildings.

It can be obtained without charge by those who want it for the helpful information it contains.

ARMCO Architectural Consulting Service

"ARMCO", MIDDLETOWN, OHIO